characteristics of urban transportation demand

a handbook for transportation planners

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
UMTA-IT-06-0049-78-1		

4. Title and Subtitle	5. Report Date
Characteristics of Urban Transportation Demand--A Handbook for Transportation Planners	April 1978
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Herbert S. Levinson	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
Wilbur Smith and Associates, New Haven, Connecticut DeLeuw Cather & Co., Washington, DC	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address **U.S. Department of Transportation** **Urban Mass Transportation Administration** **400 Seventh Street, S.W.** **Washington, D. C. 20590**	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract This report is a handbook which can be used by urban transportation planners in estimating the various components of urban transportation demand. It contains characteristics of urban bus, rail, and highway systems, and urban trip-making. A part of the Urban Transportation Planning System (UTPS) of UMTA and FHWA it provides basic inputs to the urban transportation planning process as well as ways of checking the results for reasonableness and relevance. It also complements the previously distributed UTPS handbooks:

Characteristics of Urban Transportation System (CUTS)
Available on the UTPS distribution tape and from NTIS as PB 233 580/AS

Traveler Response to Transportation System Changes
Limited copies available from FHWA (HHP-22) or from NTIS as PB 265 830/AS

This handbook is being distributed to State DOT's, MPO's and transportation libraries and will be distributed on the UTPS tape in the future. It will be available from NTIS by Project No. UMTA IT-06-0049-78-1.

An Appendix to the CUTD handbook offers detailed data on individual cities, roads, routes, stations, etc. These are not in a form that is comparable from place-to-place but may be of interest from an historical perspective for the urban areas concerned. The Appendix is available only from NTIS as Project No. UMTA IT-06-0049-78-2.

17. Key Words	18. Distribution Statement
Urban Transportation Demand Trip Generation and Production Trip Distribution Rapid Transit Expressways	**Available to the Public through the National Technical Information Service, Springfield, Virginia 22161.**

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	**Unclassified**	128	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

CHARACTERISTICS OF URBAN TRANSPORTATION DEMAND

A Handbook
For Transportation Planners

Prepared By

HERBERT S. LEVINSON

Wilbur Smith and Associates

Prepared For

THE U.S. DEPARTMENT OF TRANSPORTATION

Urban Mass Transportation Administration

Federal Highway Administration

July 1978

Reprint May 1982

FORWARD

Today's transportation planner must confront ever-changing issues within a variety of working environments. To assist him, UMTA's Planning Methods and Support program researches, develops, and distributes planning tools, including the documentation of novel planning studies, new design and forecasting techniques, and germane research results. This report is one example. Prepared by recognized experts, its content clearly presents usable planning concepts, and thus constitutes a valuable addition to the growing set of computerized and manual techniques comprising the UMTA/FHWA Urban Transportation Planning System (UTPS).

More important than the production and dissemination of a new tool is the experience and opinion of its user. Local issues change. Better methods evolve. Or, realistically, errors may appear in the final product. We depend on you, the transportation planner, to alert us to any of the above. We need your comments and your ideas. Please let us hear them, so we can continually improve our products.

You may obtain additional copies of this report from the National Technical Information Service (NTIS), Springfield, VA, 22161. On your request, please reference UMTA IT-06-0049-78-1.

Robert B. Dial, Director
Office of Planning Methods
and Support (UPM-20)
Department of Transportation
Washington, D. C. 20590

ACKNOWLEDGEMENTS

THE MATERIAL REPORTED HEREIN WAS PREPARED BY HERBERT S. LEVINSON OF WILBUR SMITH AND ASSOCIATES FOR DELEUW CATHER AND COMPANY AS PART OF THE URBAN TRANSPORTATION PLANNING SYSTEM (UTPS) PROJECT BEING PERFORMED FOR THE URBAN MASS TRANSPORTATION ADMINISTRATION AND THE FEDERAL HIGHWAY ADMINISTRATION. THE AUTHOR PARTICULARLY THANKS THESE FEDERAL AGENCIES FOR THEIR HELP AND ASSISTANCE IN PREPARING THIS MANUAL.

SPECIAL ACKNOWLEDGEMENT IS GIVEN TO THE AMERICAN PUBLIC TRANSIT ADMINISTRATION, AND TO THE VARIOUS TRANSIT PROPERTIES, PLANNING AGENCIES AND TRAFFIC-TRANSPORTATION DEPARTMENTS WHO CONTRIBUTED INFORMATION.

MANY INDIVIDUALS PROVIDED GUIDANCE TO THE RESEARCH EFFORT. THESE INCLUDE: R. DIAL, T. HILLEGASS AND S. ZIMMERMAN, UMTA; J. MCDONNELL AND D. GENDELL, FHWA; AND SCOTT RUTHERFORD, DELEUW CATHER AND COMPANY.

FINALLY, THE AUTHOR WISHES TO STATE THAT THE CONTENTS OF THIS REPORT REFLECT HIS OWN VIEWS, AND HE IS RESPONSIBLE FOR THE FACTS AND ACCURACY OF THE DATA PRESENTED HEREIN. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE DEPARTMENT OF TRANSPORTATION. THIS REPORT DOES NOT CONSTITUTE A STANDARD, SPECIFICATION, OR REGULATION.

CUTD_COMMENT/UPDATE_FORM

THIS MANUAL IS CONTINUOUSLY REVISED TO REFLECT NEW INFORMATION ON URBAN TRAVEL CHARACTERISTICS AS THESE BECOME AVAILABLE. TO ASSIST IN THIS REVISION PROCESS, PLEASE SEND ANY COMMENTS YOU MAY HAVE TO THE FOLLOWING ADDRESS, USING THIS FORM:

ROBERT B. DIAL, DIRECTOR
OFFICE OF PLANNING METHODS AND SUPPORT (UPM-20)
URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D.C. 20590

CUTD VERSION DATE:

TABLE NUMBER:

TABLE TITLE:

COMMENTS INCLUDING REFERENCE(S)

NAME:

AFFILIATION:

ADDRESS:

PHONE:

CONTENTS

CHAPTER 1	INTRODUCTION
CHAPTER 2	CHECKING THE RESULTS
CHAPTER 3	TRIP CHARACTERISTICS (SEE INDEX AT BEGINNING OF CHAPTER 3)
CHAPTER 4	CBD TRAVEL
CHAPTER 5	RAIL SYSTEM USAGE
CHAPTER 6	BUS SYSTEM USAGE
CHAPTER 7	AUTO SYSTEM USAGE

CHAPTER 1

INTRODUCTION

THIS HANDBOOK ON THE CHARACTERISTICS OF URBAN TRANSPORTATION DEMAND(CUTD) CONSTITUTES A SINGLE REFERENCE SOURCE ON DEMAND CHARACTERISTICS OF URBAN TRAVEL. IT PROVIDES A COMPREHENSIVE AND EASILY ACCESSIBLE CONSOLIDATION OF INFORMATION RELATIVE TO THE MANY DIMENSIONS AND ASPECTS OF URBAN TRAVEL BEHAVIOR AND TRANSPORTATION SYSTEM USAGE. PART OF THE URBAN TRANSPORTATION PLANNING SYSTEM (UTPS) OF PLANNING SOFTWARE AND MANUALS, IT IS PRODUCED AND MAINTAINED BY THE URBAN MASS TRANSPORTATION ADMINISTRATION AND THE FEDERAL HIGHWAY ADMINISTRATION OF THE U.S. DEPARTMENT OF TRANSPORTATION.

THE HANDBOOK IS INTENDED TO GUIDE TRANSPORTATION PLANNERS, ENGINEERS, AND DECISION-MAKERS IN:

ASSESSING DEMANDS FOR URBAN HIGHWAY AND TRANSIT SYSTEMS;

APPLYING AND VALIDATING CONVENTIONAL TRANSPORTATION PLANNING TECHNIQUES; AND,

ACHIEVING REALISTIC AND REASONABLE DECISIONS REGARDING URBAN TRANSPORTATION IMPROVEMENTS.

TOWARD THESE OBJECTIVES, THE HANDBOOK:

CONTAINS SUMMARY CHARACTERISTICS OF URBAN TRANSPORTATION SYSTEMS;

PRESENTS URBAN AREA AGGREGATE AND DISAGGREGATE TRANSPORTATION DEMAND DATA;

SETS FORTH KEY PARAMETERS FOR URBAN TRANSPORTATION DEMAND ANALYSES;

CONTAINS INPUTS TO, AND CROSS CHECKS OF, THE CONVENTIONAL TRANSPORTATION PLANNING PROCESS.

IN DEVELOPING AND ASSESSING REGIONAL TRANSPORTATION FACILITIES WHICH REQUIRE MAJOR CAPITAL INVESTMENTS, IT IS ESSENTIAL THAT RESULTS BE REASONABLE AND DECISIONS REALISTIC. NOT ONLY IS THERE A NEED FOR CLEAR DESCRIPTION OF PARAMETERS AND PROCEDURES, BUT FOR WAYS TO CROSS-CHECK AND VERIFY TRAVEL DEMAND FORECASTS AS WELL.

COMPLEMENTARY HANDBOOKS

THIS HANDBOOK IS ONE OF THREE IN A SERIES ON OVERALL URBAN TRANSPORTATION STATISTICS WHICH IS INTENDED TO PROVIDE THE PRACTITIONER WITH INFORMATION ON URBAN TRANSPORTATION SYSTEM CHARACTERISTICS, AND THE IMPACT OF THE TRANSPORTATION SYSTEM ON URBAN TRAVEL. THE OTHER HANDBOOKS IN THE UTPS "CHARACTERISTICS" SERIES, SPONSORED BY THE URBAN MASS TRANSPORTATION ADMINISTRATION--FEDERAL HIGHWAY ADMINISTRATION, ARE:

CHARACTERISTICS OF URBAN TRANSPORTATION SYSTEMS, A HANDBOOK FOR TRANSPORTATION PLANNERS, PREPARED BY DELEUW CATHER AND COMPANY AND UPDATED BY ROCK CREEK ASSOCIATES, JULY 1977.

TRAVELER RESPONSE TO TRANSPORTATION SYSTEM CHANGES, PREPARED BY R.H. PRATT ASSOCIATES, FEBRUARY 1977.

SOURCES

THE INFORMATION CONTAINED IN THIS HANDBOOK HAS BEEN ASSEMBLED FROM A WIDE VARIETY OF SOURCES. THESE INCLUDE TRANSIT RIDERSHIP STATISTICS, URBAN TRAFFIC VOLUME COUNTS, U.S. CENSUS JOURNEY-TO-WORK AND EMPLOYMENT DATA, AND COMPREHENSIVE METROPOLITAN AREA TRANSPORTATION PLANNING STUDIES.

AN ATTEMPT HAS BEEN MADE TO DEVELOP COMPARABLE INFORMATION ON A FACILITY-BY-FACILITY AND CITY-BY-CITY BASIS. IT SHOULD BE NOTED, HOWEVER, THAT THERE ARE VARIATIONS FROM PLACE TO PLACE IN REPORTING SYSTEMS, AREAL UNITS, DEFINITIONS, AND SURVEY YEARS. DESPITE THESE LIMITATIONS, THE HANDBOOK PROVIDES A COMPREHENSIVE PICTURE OF THE DIMENSIONS AND NATURE OF URBAN TRAVEL BEHAVIOR IN BOTH CITY-SPECIFIC AND COMPARATIVE CONTEXTS.

ORGANIZATION AND USE OF MANUAL

THE HANDBOOK IS ORGANIZED FOR EASY USE BY PRACTICING TRANSPORTATION PLANNERS, ENGINEERS, AND ADMINISTRATORS IN SELECTING PARAMETERS, ANALYZING SYSTEM PERFORMANCE, AND ESTABLISHING SOUND TRANSPORTATION PLANNING DECISIONS.

REMAINING CHAPTERS ARE ORGANIZED AS FOLLOWS:

CHAPTER 2 PROVIDES GUIDELINES, INPUTS, AND CROSS-CHECKS FOR THE LONG-RANGE URBAN TRANSPORTATION PLANNING PROCESS.

CHAPTER 3 CONTAINS BASIC EXHIBITS ON URBAN TRAVEL BEHAVIOR RELATIVE TO TRIP RATES, PURPOSES, LENGTHS, MODES, AND HOURLY VARIATIONS.

CHAPTER 4 PRESENTS TRAVEL DEMAND CHARACTERISTICS FOR THE CENTRAL BUSINESS DISTRICT.

CHAPTERS 5, 6 AND 7 SET FORTH EXHIBITS DESCRIBING RAIL, BUS, AND HIGHWAY SYSTEM USAGE, RESPECTIVELY.

SOURCE REFERENCES AND DATA QUALIFICATIONS ARE GIVEN FOR ALL TABLES, THEREBY ENABLING THE HANDBOOK TO BE USED EASILY AND INDEPENDENTLY WITH FULL COMPREHENSION. IN ADDITION, A DETAILED INDEX TO THE EXTENSIVE DATA IN CHAPTER 3 IS INCLUDED AT THE BEGINNING OF THAT CHAPTER TO FACILITATE QUICK IDENTIFICATION OF REQUIRED DATA ITEMS. PLEASE USE THIS INDEX. INTERESTED USERS OF THIS HANDBOOK MAY OBTAIN AN APPENDIX TO THIS WORK WHICH PRESENTS A VAST VARIETY OF INDIVIDUAL URBAN AREA DATA OF SIMILAR NATURE TO

THAT PRESENTED HEREIN. THE APPENDIX, DUE TO ITS LENGTH AND THE MISCELLANEOUS AND NON-COMPARABLE NATURE OF THE DATA PRESENTED, WAS NOT INCLUDED IN THE MAIN HANDBOOK BUT IS AVAILABLE FROM THE NATIONAL TECHNICAL INFORMATION SERVICE.

THE HANDBOOK MAY BE USED TO COMPARE TRAVEL PARAMETERS FOR A GIVEN COMMUNITY WITH THOSE IN OTHER CITIES, THEREBY PROVIDING A BASIS FOR CROSS-CHECKING AND REFINEMENT. SIMILARLY, TRANSPORTATION USAGE FIGURES CAN BE COMPARED WITH THOSE FOR GENERALLY COMPARABLE SYSTEMS ELSEWHERE, AND CROSS-CHECKED FOR REASONABLENESS. IT PROVIDES INPUTS FOR USE WHERE INFORMATION IS LACKING AND IT CONTAINS BROAD MACRO-MEASURES FOR USE BY DECISION-MAKERS AND ADMINISTRATORS.

THE HANDBOOK IS INTENDED AS A GUIDE AND MUST BE USED AS SUCH. THE VARIOUS RELATIONSHIPS REPRESENT SPECIFIC LOCALITIES AT GIVEN POINTS IN TIME. CARE, THEREFORE, SHOULD BE TAKEN IN APPLICATION TO SPECIFIC SITUATIONS AND GOOD JUDGEMENT SHOULD BE EXERCISED. SOME DATA ARE MORE AGED THAN OTHERS AND THE USER SHOULD BEWARE OF DATED MATERIAL. JUDICIOUSLY USED, THE HANDBOOK PROVIDES A GUIDE TO ACHIEVING SOUND URBAN TRANSPORTATION DECISIONS.

CHAPTER 2

CHECKING THE RESULTS(1)

(1) THE CONTENTS OF CHAPTER 2 ARE SYNOPSIZED IN TABLE 2-1.

TRANSPORTATION DEMAND FORECASTS AND SYSTEMS ASSIGNMENT OBTAINED FROM THE TRANSPORTATION PLANNING PROCESS SHOULD BE CHECKED FOR REASONABLENESS. THE FOLLOWING KEY QUESTIONS SHOULD BE ADDRESSED IN SUCH AN EVALUATION:

ARE THE METHODS USED CONSISTENT WITH ESTABLISHED PROCEDURES AND THOSE USED ELSEWHERE?

ARE THE ASSUMPTIONS AND PARAMETERS USED REASONABLE IN VIEW OF PAST TRENDS, BASE-YEAR CONDITIONS, AND PROJECTED GROWTH RATES?

ARE THE RESULTS OF THE FORECASTS REALISTIC WHEN COMPARED WITH ACTUAL EXPERIENCES IN THE SAME URBAN AREAS, AND IN OTHER URBAN AREAS?

ARE THE BIASES IN THE FORECASTS AND ASSIGNMENT PROCEDURES MINIMIZED?

THE FOLLOWING PARAMETERS SHOULD BE CHECKED IN DEVELOPING AND ANALYZING DEMAND FORECASTS.

NUMBER OF TRIPS, INCLUDING TRIPS PER DWELLING, TRIPS PER CAPITA

TRIP COMPOSITION BY PURPOSE AND MODE

TRIP LENGTHS

PERSON MILES AND HOURS PER CAPITA AND PER DWELLING

VEHICLE MILES AND HOURS PER CAPITA, PER DWELLING AND PER REGISTERED CAR

CBD MODAL SPLIT VERSUS CBD CORDON COUNTS

TRANSIT RIDERSHIP; CORRIDOR AND LINE

AUTO VOLUMES; CORRIDOR AND FACILITY

1. POPULATION, EMPLOYMENT, LAND USE, AND CAR OWNERSHIP

POPULATION AND LAND-USE FORECASTS SHOULD RECOGNIZE THAT CONSIDERABLE PORTIONS OF FUTURE URBANIZED AREAS ARE ALREADY IN PLACE. BECAUSE MAJOR GROWTH IS NOT LIKELY IN THESE BUILT-UP AREAS, RADICAL CHANGES IN PAST GROWTH GENERALLY SHOULD BE AVOIDED. A RANGE IN THE "PLANNING HORIZON YEAR" MAY PROVE PREFERABLE TO A RANGE IN FORECASTS.

DWELLING_UNITS - RELATIONSHIPS BETWEEN POPULATION AND OCCUPIED DWELLING UNITS CAN BE BASED ON PAST TRENDS FOR THE URBAN AREA. A RANGE OF 3.0 TO 3.5 PERSONS PER DWELLING ON A REGIONAL OR ZONAL BASIS IS COMMON BASED ON 1970-1975 CONDITIONS. (SEE TABLE 2-1 FOR SUMMARY DATA ON THIS SECTION.) IN THE FUTURE, THE NUMBER OF PERSONS PER DWELLING UNIT IS LIKELY TO DECREASE SLIGHTLY, BECAUSE OF THE INCREASED ELDERLY IN THE POPULATION AND A REDUCTION IN FAMILY SIZE.

EMPLOYMENT - THE EMPLOYMENT "PARTICIPATION RATIO" FOR U.S. URBAN AREAS GENERALLY REPRESENTS 35 TO 40 PERCENT OF THE POPULATION. VALUES OUTSIDE OF THIS RANGE SHOULD BE REVIEWED FOR REASONABLENESS. IN GENERAL, CBD EMPLOYMENT WILL REPRESENT LESS THAN 20 PERCENT OF THE REGION'S TOTAL, EXCEPT IN SMALL CITIES. (EMPLOYMENT IN MANHATTAN SOUTH OF 59TH STREET ACCOUNTS FOR ABOUT 25 PERCENT OF THE TRI-STATE (NEW YORK) REGION'S TOTAL).

LAND_CONSUMPTION - LAND USED FOR URBAN PURPOSES SHOULD GENERALLY GROW FASTER THAN POPULATION, ASSUMING CURRENT LAND-USE POLICIES AND ENERGY AVAILABILITY. THIS IMPLIES THAT THE DENSITY GRADIENT--I.E., THE RATE THAT RESIDENTIAL DENSITY DECREASES WITH INCREASING TIME-DISTANCE FROM THE CITY CENTER--WILL GENERALLY FLATTEN OVER TIME.

CAR_OWNERSHIP - CAR OWNERSHIP IS LARGELY A FUNCTION OF FAMILY SIZE, HOUSEHOLD INCOME, AND POPULATION DENSITY. TABLE 3-3 ILLUSTRATES SOME AVERAGE RATES.

2. TRIP_GENERATION

TRIP GENERATION GUIDELINES ARE SHOWN IN TABLES 3-5 THROUGH 3-9.

TRIP_PRODUCTION - URBAN TRIP PRODUCTION RELATES TO THE HOUSEHOLD END OF THE TRIP. TRIP PRODUCTION RATES ARE GENERALLY EXPRESSED AS A FUNCTION OF INCOME, FAMILY SIZE AND POPULATION DENSITY. CAR OWNERSHIP, WHICH CORRELATES WITH SEVERAL OF THESE VARIABLES, PROVIDES A VERY USEFUL INDEPENDENT VARIABLE. ABOUT 2.5 PERSON TRIP PRODUCTIONS PER PERSON-PER DAY IS A REASONABLE AVERAGE WHICH TRANSLATES INTO ABOUT 8.0 ON A PER DWELLING UNIT BASIS. THESE ARE INTERNAL PERSON TRIPS FOR THE PERIOD 1970-1975.

> TABLE 3-7 SHOWS THE COMBINED EFFECTS OF FAMILY INCOME AND CAR OWNERSHIP ON URBAN TRIP RATES.

TRIP_PURPOSE - THE NUMBER OF WORK TRIPS HAS REMAINED CONSTANT AT ABOUT 0.60 TO 0.70 PER PERSON OVER THE PAST SEVERAL DECADES. (1) THIS IMPLIES THAT THE GREATEST INCREASES IN FUTURE TRIPS WILL BE FOR NON-WORK PURPOSES.

---

(1) FOR EXAMPLE, IN WASHINGTON, D.C., THE WORK TRIPS/CAPITA DECREASED FROM 0.71 IN 1942 TO 0.69 IN 1955, AND 0.63 IN 1968. SOURCE: WASHINGTON COUNCIL OF GOVERNMENTS.

TABLE 2-1

GUIDELINES FOR CHECKING THE TRANSPORTATION PLANNING PROCESS

ITEM	FUNCTION-INPUT	PARAMETERS	GUIDELINES & SOURCES	ILLUSTRATIVE VALUES
POPULATION	INPUT FOR EMPLOYMENT, LAND-USE, TRIP GENERATION		U.S. CENSUS	
DWELLING UNITS	AS ABOVE		3.0-3.5 PERSONS PER DWELLING UNIT U.S. CITIES (TABLE 3-3)	3.3 PERSONS PER DWELLING UNIT
EMPLOYMENT	INPUT FOR TRIP ATTRACTION		TOTAL EMPLOYMENT EQUAL TO BETWEEN .35-.40 OF TOTAL POPULATION (U.S. CENSUS)	RATIO OF 0.40
DEVELOPED LAND AREA	INPUT FOR DENSITY, AND TRIP ATTRACTION		DEVELOPED URBAN LAND WILL INCREASE MORE RAPIDLY THAN POPULATION	-
POPULATION DENSITY	INPUT FOR SYSTEMS PLANNING, TRIP GENERATION		DENSITY GRADIENT WILL INCREASE GREATER WITH TIME	-
FAMILY INCOME	INPUT FOR CAR OWNERSHIP-TRIP PRODUCTION		U.S. CENSUS OR SPECIAL SURVEYS	-
CAR OWNERSHIP	TRIP PRODUCTION AND MODE-SPLIT	INCOME, DENSITY & D/U SIZE, WHERE AVAILABLE	WILL INCREASE MORE RAPIDLY THAN POPULATION, (TABLE 3-3)	1.2/DU OVERALL
TOTAL PERSON-TRIPS/DAY (WITHIN STUDY AREA)	MODAL-ANALYSIS SYSTEM ASSIGNMENT	INCOME, CAR OWNERSHIP	TRIPS INCREASE FASTER THAN TOTAL POP. URBAN AREA. 2.5-3.0 TRIPS/PERSON-REASONABLE RANGE FOR FUTURE CONDITIONS. (TABLES 3-3 THRU 3-9)	2.5 TRIPS/PERSON/DAY FOR 2.75 PERSONS PER CAR

ITEM	FUNCTION-INPUT	PARAMETERS	GUIDELINES & SOURCES	ILLUSTRATIVE VALUES
WORK TRIPS/ PERSON/DAY (PRODUCTION)	TRIP DISTRIBU-TION MODAL-ANALYSIS	POPULATION	WORK TRIPS REMAIN CONSISTENT AT ABOUT 0.6-0.7 TRIPS/PERSON/ DAY, OR ABOUT 1.8 PER WORKER	0.6 TRIPS/ PERSON/ DAY
NON-WORK TRIPS (PRODUCTION)	TRIP DISTRIBU-TION MODAL-ANALYSIS	INCOME, CAR OWNERSHIP	NON-WORK TRIPS INCREASE FASTER THAN WORK TRIPS.	1.9 TRIPS/ PERSON/ DAY
TRIP ATTRACTION	TRIP DISTRIBU-TION, MODAL ANALYSIS	EMPLOYMENT FLOOR SPACE STUDENTS	(TABLE 3-12)	-
TRUCK TRIPS	IDENTIFY SOURCES OF TRUCK TRAVEL. TRIP DISTRIBU-TION AND ASSIGNMENT	POPULATION, LAND USE, FLOOR SPACE	APPROX. 15-20% OF ALL VEHICLE TRIPS. (TABLES 3-28 THRU 3-30)	TRUCKS REPRESENT 15% OF ALL VEH. TRIPS; CARS/.85 =TOTAL VEH. TRIPS
TRUCK TRAVEL	TRIP DISTRIBU-TION AND ASSIGNMENT	POPULATION	(TABLE 3-28) ASSUME 0.8-1.2 VMT/CAPITA/DAY	1 VMT/ CAPITA/ DAY
TRIP DISTRIBUTION	CONNECT TRIP PRODUCTIONS AND ATTRACTIONS	ZONE-ZONE TIMES	REPORT "URBAN TRIP DISTRIBUTION FRICTION FACTORS" FHWA 1974	-
PERSON HOURS OF TRAVEL	CHECK AND CONTROL OF DISTRIBUTION	POPULATION	PERSON HOURS/PERSON SHOULD REMAIN RELATIVE-LY CONSTANT AT 0.75-0.85/DAY.	-
PERSON-MILES OF TRAVEL (OVER-THE-ROAD)	CHECK FOR CONTROL OF DISTRIBUTION	POPULATION; SYSTEM SPEED	PERSON MILES/ PERSON ABOUT 10-15,1975, 12-19, FUTURE YEAR.	13.0 PERSON MILES/ PERSON/ DAY
VEHICLE-TRIP-LENGTH-MILES (OVER-THE-ROAD)	CHECK FOR CONTROL OF DISTRIBUTION	POPULATION, URBAN STRUCTURE	GENERALLY 4-6 MILES IN 250,000 -3,000,000 POPU-LATION RANGE. (TABLE 3-22)	5.0 MILES/ TRIP, ALL PURPOSES

ITEM	FUNCTION-INPUT	PARAMETERS	GUIDELINES & SOURCES	ILLUSTRATIVE VALUES
VEHICLE MILES/ REGISTERED PASS. CAR	CHECK FOR CONTROL OF DISTRIBUTION	CAR REGISTRATION, POPULATION	GENERALLY 24-28 MILES IN 250,000 -3,000,000 POPULATION RANGE.10-15 VMT/CAPITA, REASONABLE RANGE	26 MILES/ VEH./ DAY
CAR OCCUPANCY	OBTAIN VEHICULAR TRIPS	VARIES WITH TRIP PURPOSE	1.4-1.6 PERSONS/ CAR REASONABLE RANGE FOR 1975 CONDITIONS, (TABLES 3-2, 3-13)	1.5 PERSONS PER CAR
MODAL SPLIT	ALLOCATE TRAVEL AMONG CAR, BUS, RAIL	CAR OWNERSHIP, TRAVEL DISUTILITIES DEVELOP MODELS ON A DISAGGREGATE BASIS.	AS AN AREA-WIDE GUIDE 10-15% TRANSIT (INCLUDING SCHOOL BUS) REPRESENTS A REASONABLE UPPER LIMIT FOR MOST AREAS.(TABLE 3-3)	10% OF ALL PERSON-TRIPS.
CBD EMPLOYMENT	CBD TRIP ATTRACTIONS. CHECK MODAL DISTRIBUTION AND TRANSIT ASSIGNMENTS	-	CBD EMPLOYMENT WILL BECOME A SMALLER PROPORTION OF METROPOLITAN AREA EMPLOYMENT. FOR A LARGE URBAN AREA IT SHOULD GENERALLY BE LESS THAN 15% OF THE TOTAL.	FOR 1,000,000 A STRONG CBD WOULD HAVE 15% OR 60,000.
CBD PEAK CORDON CROSSINGS AND MODAL SPLIT	CHECK HIGHWAY & TRANSIT SYSTEM ASSIGNMENTS	EMPLOYMENT, DENSITY, CAR OWNERSHIP, DISUTILITY	PEAK HOUR CORDON VOLUMES OF OVER 100,000 WILL BE LIMITED TO URBAN AREAS OF OVER 2,000,000. TRANSIT WILL NOT GENERALLY EXCEED 65% OF PEAK MOVEMENT ACROSS CBD CORDON. (TABLES 3-35, 5-9, 7-5)	TOTAL CBD CORDON CROSSINGS IN PEAK HR. WOULD APPROXIMATE 54,000 WITH UP TO 27,000 BY TRANSIT.

ITEM	FUNCTION-INPUT	PARAMETERS	GUIDELINES & SOURCES	ILLUSTRATIVE VALUES
RAPID TRANSIT RIDERSHIP	COST-EFFECTIVE-NESS EVALUATION	RESULT OF SYSTEMS ASSIGNMENT; CHECK BY CBD EMPLOY-MENT AND CORDON	MAXIMUM CORRIDOR RIDERSHIP RANGES SHOWN IN TABLE 3-35. DIVIDE BY 15% TO OBTAIN DAILY TWO-WAY VOLUMES.	MAXIMUM CORRIDOR ONE-WAY RIDER-SHIP URBAN AREAS OF POPULATION= 1,000,000 - 3,000/HR.
			REASONABLE ASSUMP-TIONS THAT PEAK AUTO TRIPS TO CBD WILL RE-MAIN CONSTANT, WITH NO CAPACITY INCREASE. ALLOCATE GROWTH TO CBD CORDON TO RAPID AND SURFACE TRANSIT.	
			SYSTEM RIDERSHIP GENERALLY FROM 1-2.4 TIMES CBD EM-PLOYMENT DEPEN-DING UPON EXTENT OF SYSTEM. MAXIMUM LINE RIDERSHIP ABOUT .4 EMPLOYMENT. (TABLE 5-10)	MAX.LINE IN URBAN AREA OF 1,000,000 WITH 60,000 CBD JOBS ABOUT 24,000/ DAY.
RAPID TRANSIT			65-80% OF RIDERSHIP HAS ORIGIN OR DESTINATION IN CBD. (TABLE 5-4).	
MODES OF ARRIVAL AT STATIONS			25-35% ARE LIKELY TO WALK TO AND FROM STATIONS. MAY REDUCE TO 15-25% IN SUBURBAN-ORIENTED SYSTEMS. (TABLE 5-5).	

ITEM	FUNCTION-INPUT	PARAMETERS	GUIDELINES & SOURCES	ILLUSTRATIVE VALUES
FREEWAY VOLUMES	COST-EFFECTIVE EVALUATION	SYSTEM EXTENT CONFIGURATION; VMT, URBAN POPULATION	MAX. LOAD POINT ON SYSTEM UNDER 200,000 UNLESS URBAN POPULATION EXCEEDS 2,000,000 WHEN IT MAY REACH 250,000. TABLE 5-10. TABLE 7-4 GIVES FREEWAY/ ARTERIAL FUNCTIONAL DISTRIBUTION.	RANGE IN MAXIMUM LOAD PT. FOR URBAN POPULATION OF 1,000,000 60,000-150,000

TRIP_ATTRACTION - URBAN TRIP ATTRACTION RELATES TO NON-RESIDENTIAL LAND-USES FOR MOST TRIP PURPOSES. RATES CAN BE DERIVED FOR PRINCIPAL LAND-USE CATEGORIES, BASED ON PARAMETERS SUCH AS SQUARE FEET OF FLOOR SPACE, EMPLOYMENT, AND ENROLLED STUDENTS. THIS TECHNIQUE HAS BEEN SUCCESSFULLY USED IN EVALUATING THE TRANSPORTATION IMPACTS OF NEW LAND DEVELOPMENTS, INCLUDING MAJOR URBAN RENEWAL PROJECTS; IT CAN ALSO BE USED TO DERIVE URBAN AREA-WIDE TRIP ATTRACTION RATES.

TRIP ATTRACTION PROCEDURES AND GUIDELINES ARE SHOWN IN TABLE 3-12. SPECIAL CONSIDERATION SHOULD BE GIVEN TO MAJOR TRIP GENERATORS (E.G., AIRPORTS, SPORTS STADIUMS, HOSPITALS, AND REGIONAL SHOPPING CENTERS) THAT COMPRISE LAND USES WHICH ARE UNIQUE AND DO NOT SHOW THE SAME TRIP ATTRACTION CHARACTERISTICS THAT MAY BE TYPICAL WITHIN AN URBAN AREA.

> TABLE 3-12 PRESENTS PERSON-TRIP GENERATION RATES BASED ON AN EXPANSION OF THE VEHICLE-TRIP RATES CONTAINED IN THE PHOENIX-MARICOPA COUNTY TRIP GENERATION STUDIES INCLUDED IN THE FHWA REPRINT "TRIP GENERATION INTENSITY FACTORS", JUNE 1977. THESE RATES ARE ESPECIALLY USEFUL IN FORECASTING THE EXPECTED TRIP GENERATION OF MAJOR NEW LAND-USE DEVELOPMENTS; AND SPECIAL TRAVEL GENERATORS. THE CAR OCCUPANCY AND MODAL SPLIT ASSUMPTIONS SHOWN IN THIS TABLE SHOULD BE MODIFIED BASED UPON THE SPECIFIC LOCAL EXPERIENCE, AS WELL AS LOCATIONAL FACTORS.(1)

TRUCK_TRIPS - THE NUMBER OF TRUCK TRIPS WILL VARY AMONG URBAN AREAS, DEPENDING UPON THE EXTENT TO WHICH LIGHT TRUCKS (I.E., PANELS, PICK-UPS) ARE USED AS SECOND PASSENGER CARS.

"RESIDENT" GOODS-VEHICLE GUIDELINES FOR A "TYPICAL" MEDIUM-SIZED URBANIZED AREA ARE SET FORTH IN TABLE 3-28. THIS TABLE SHOWS:

> 28 REGISTERED GOODS VEHICLES PER 1,000 RESIDENTS,
> ABOUT 10 DAILY TRIPS PER TRUCK,
> ABOUT 27 DAILY VEHICLE MILES PER VEHICLE
> (ABOUT 1 VMT PER RESIDENT), AND,
> ABOUT 2.7 MILES PER TRUCK TRIP.

---

(1) THE FOLLOWING PROCEDURES ARE SUGGESTED IN DERIVING TRIP ATTRACTION RATES. (1) THE TOTAL PERSON-DESTINATIONS SHOULD BE DERIVED. (2) THE WORK TRIP DESTINATIONS SHOULD BE COMPUTED, BASED ON EMPLOYMENT. (3) NON-WORK DESTINATIONS SHOULD BE OBTAINED BY SUBTRACTING THE WORK TRIPS FROM THE TOTAL TRIPS. (4) THE PURPOSE BREAKDOWN CAN BE ESTIMATED FOR NON-WORK TRIPS BASED ON THE RIGHT HAND PORTION OF THE TABLE.

TRUCK TRIP GENERATION RATES CAN BE DERIVED FROM ZONAL REGRESSION EQUATIONS OR THROUGH THE USE OF LAND-USE RATES, SUCH AS THE TYPICAL VALUES SHOWN IN TABLE 3-29.

IN ESTIMATING CBD TRUCK TRAVEL AND FACILITY NEEDS, IT MAY BE MORE FEASIBLE TO WORK WITH ACTUAL TRUCK "STOPS" (I.E., DESTINATIONS) RATHER THAN TRUCK TRIPS. TYPICAL CBD TRUCK "STOP" GUIDELINES ARE SHOWN IN TABLE 3-30 FOR VARIOUS COMMERCIAL USES.

3. TRIP DISTRIBUTION

TRIP DISTRIBUTION PROCEDURES WILL NORMALLY INVOLVE CALIBRATION BY TRIP TIMES (GRAVITY MODEL), TRIP DISTANCES (OPPORTUNITY MODEL), OR IN SOME CASES, WEIGHTED TIME-DISTANCE.

GRAVITY MODEL - TYPICAL NORMALIZED FRICTION FACTORS FOR BASIC AUTO-DRIVER PURPOSES ARE SHOWN IN THE FHWA PUBLICATION, "URBAN TRIP DISTRIBUTION FRICTION FACTORS", 1974. THESE FACTORS CAN BE USED AS A STARTING POINT IN GRAVITY MODEL CALIBRATION.

APPLICATION OF THE CALIBRATED GRAVITY MODEL ASSUMES THAT THE FRICTION FACTORS WILL REMAIN CONSTANT OVER TIME. IT TENDS TO PRODUCE FUTURE TRIP TIME DISTRIBUTIONS BY PURPOSE WHICH ARE SIMILAR TO THOSE FOR BASE YEAR CONDITIONS. WHERE MAJOR CHANGES IN ACCESSIBILITY ARE INTRODUCED INTO THE SYSTEM, THIS CAN HAVE THE EFFECT OF INCREASING TRAVEL DISTANCES, PERSON-MILES OF TRAVEL, AND VEHICLE-MILES OF TRAVEL. MORE SIGNIFICANTLY, THERE ARE NO REDUCTIONS IN AVERAGE TRIP TIMES, DESPITE THE INCREASED TRANSPORTATION INVESTMENT.

THIS CONDITION CAN BE ALLEVIATED BY USING PEAK AND OFF-PEAK NETWORKS AND SPEEDS FOR WORK AND NON-WORK TRIPS, WITH REALISTIC SPEED ASSUMPTIONS. IN SOME CASES, TRIP DISTRIBUTION SHOULD BE ITERATIVE, BASED ON SYSTEM SPEEDS RESULTING FROM CAPACITY RESTRAINED ASSIGNMENTS. ALTERNATIVELY, IT MAY BE DESIRABLE TO UTILIZE WEIGHTED TIME-AND-DISTANCE FACTORS IN MODEL CALIBRATION. THE RELATIVE CONSTANCY OF DAILY PERSON-HOURS PER CAPITA (0.75 TO 0.85) IN VARIOUS URBAN AREAS AT VARIOUS POINTS IN TIME SUGGESTS THAT INCREASES IN BOTH THE NUMBER AND AVERAGE LENGTH (MILES) OF TRIPS WILL OVERSTATE FUTURE TRAVEL DEMANDS.

SPEEDS WHICH RESULT FROM SYSTEM ASSIGNMENTS SHOULD BE COMPARED TO INPUT SPEED ASSUMPTIONS USED TO DERIVE TRIP DISTRIBUTION AND FRICTION FACTORS. ITERATION OF DISTRIBUTION AND ASSIGNMENT STEPS MAY BE NECESSARY TO OBTAIN REALISTIC PROJECTIONS.

PERSON-TRAVEL - THE FOLLOWING GUIDELINES CAN CROSS-CHECK RESULTS OF THE TRIP DISTRIBUTION AND SYSTEMS ASSIGNMENT PROCEDURES:

> AIRLINE PERSON-MILES OF TRAVEL BASED ON 1970-75 CONDITIONS SHOULD RANGE FROM 12 TO 15 MILES PER CAPITA PER DAY. (THESE UNITS ARE MEASURED IN STRAIGHT LINE DISTANCES BETWEEN CENTROIDS.)
>
> APPROXIMATELY 0.75 TO 0.85 PERSON-HOURS PER CAPITA IS SPENT IN TRAVEL EACH DAY.

VEHICLE-MILES OF TRAVEL (VMT) - OVER-THE-ROAD VMT AND VEHICLE TRIP LENGTHS PROVIDE A VALUABLE CROSS-CHECK OF THE REASONABLENESS OF TRAFFIC FORECASTS. THE FOLLOWING FORMULAE CAN SERVE AS GUIDES:

$$\text{LOG(VMT PER AUTO)} = 0.99 + 0.07 \times (\text{LOG POP.})$$
$$R = .66 \quad SY = 0.04$$

$$\text{LOG}\left[\begin{array}{l}\text{AVERAGE} \\ \text{VEH. TRIP} \\ \text{LENGTH} \\ \text{(MILES)}\end{array}\right] = 0.39 + 0.18 \times (\text{LOG POP.})$$
$$R = .85 \quad SY = 0.06$$

GENERAL VEHICLE TRIP LENGTH AND VMT GUIDELINES BASED ON THESE FORMULAS ARE THAT TOTAL DAILY VMT/CAR SHOULD BE LESS THAN 30.0 AND AVERAGE VEHICLE TRIP LENGTHS SHOULD NOT EXCEED SIX MILES, EXCEPT IN VERY LARGE URBAN AREAS.

4. MODE CHOICE AND ASSIGNMENT

THE OUTPUT OF NETWORK ASSIGNMENT PROCEDURES IS NORMALLY EXPRESSED IN THE FORM OF PERSON OR VEHICLE-MILES, PERSON OR VEHICLE-HOURS, AND VEHICLE OR PASSENGER VOLUMES ON INDIVIDUAL ELEMENTS OF THE TRANSPORTATION SYSTEM FOR EACH MODE. RESULTS OF ASSIGNMENTS, BOTH SYSTEMWIDE AND ON AN INDIVIDUAL FACILITY BASIS, SHOULD BE REVIEWED FOR REASONABLENESS. COMPARISONS WITH BASE-YEAR CONDITIONS ARE A POINT OF DEPARTURE. DESIGN-YEAR PROJECTIONS SHOULD BE COMPARED WITH USAGE FACTORS FOR EXISTING FACILITIES IN COMPARABLY SIZED URBAN AREAS.

CBD AND NON-CBD TRAVEL COMPARISONS - TABLE 3-34 SHOWS TYPICAL URBAN AREA TRAVEL DEMAND INDICES FOR URBAN AREAS OF 100,000 AND 1,000,000, RESPECTIVELY. IT ALSO PRESENTS DETAILED EMPLOYMENT, CORDON CROSSING, AND PERSON-DESTINATIONS FOR "CENTRALIZED" DOWNTOWN AREAS. THE DATA REPRESENTS A REASONABLE UPPER RANGE OF WHAT MIGHT OCCUR IN THE TYPICAL UNITED STATES CITY CENTER.

CBD CORDON COUNTS AND RAPID TRANSIT RIDERSHIP - PEAK-HOUR TRAVEL DEMANDS IN RADIAL CORRIDORS APPROACHING A CENTRALIZED CBD ARE SHOWN IN TABLE 3-35. THIS TABULATION IS BASED ON ANALYSES OF CORDON COUNT DATA INCLUDING ACTUAL MODAL AND SUB-MODAL SPLITS IN EXISTING UNITED STATES AND CANADIAN CITIES. IN CITIES OF OVER 2,000,000, WITH EXTENSIVE RAIL TRANSIT SYSTEMS (EXCLUDING NEW YORK CITY) ABOUT 50-60 PERCENT OF THE TOTAL TRANSIT RIDERSHIP IS "OFF-STREET". (1) A 65 PERCENT MODAL ALLOCATION OF RAIL-TO-TOTAL TRANSIT, THEREFORE, APPEARS REASONABLE AS AN UPPER LIMIT OF RAIL TRANSIT POTENTIALS IN LARGE CITIES.

FOR AN URBAN AREA OF 2,000,000, THE HEAVIEST CORRIDOR WOULD GENERATE A POTENTIAL RAIL TRANSIT ONE-WAY HOURLY VOLUME FROM 4,400 TO 13,800 PERSONS. THIS WOULD CORRESPOND TO A DAILY TWO-WAY RIDERSHIP OF 30,000 TO 90,000, ASSUMING THAT THE ONE-WAY PEAK HOUR, MAXIMUM LOAD POINT VOLUME IS FIFTEEN PERCENT OF THE DAILY TWO-WAY TOTAL TRAVEL.

RAPID TRANSIT RIDERSHIP - THE RELATIONS BETWEEN RAPID TRANSIT-COMMUTER RAIL RIDERSHIP AND CBD EMPLOYMENT ARE SHOWN IN TABLE 5-9. OVERALL, DAILY SYSTEM RIDERSHIP RANGES FROM 0.5 TO 2.6 PER CBD EMPLOYEE, NEW YORK CITY AND TORONTO EXCLUDED, DEPENDING UPON THE EXTENT OF THE SYSTEM. FOR TORONTO, THE FACTOR IS 3.4; FOR NEW YORK IT IS 2.5, BASED ON MANHATTAN SOUTH OF 59TH STREET; AND 4.4 BASED ON MIDTOWN AND DOWNTOWN ALONE.

THE RANGES FOR THE MAXIMUM LINE RIDERSHIP ARE SHOWN IN TABLE 5-10. THE TABLE SHOWS A RANGE IN RIDERSHIP OF 0.3 TO 0.5 TIMES THE CBD EMPLOYMENT FOR U.S. CITIES (1973-1975 CONDITIONS). THUS, A BROAD CROSS-CHECK OF MAXIMUM LINE RIDERSHIP MIGHT APPROXIMATE 40 PERCENT OF THE DOWNTOWN EMPLOYMENT. THIS RESULTS IN A MAXIMUM LOAD-POINT DAILY VOLUME OF 40,000 TO 60,000 WHERE CBD EMPLOYMENT IS UNDER 150,000. (THESE VALUES WOULD COMPARE WITH THE 30,000 TO 90,000 DAILY RIDERSHIP FIGURES IMPLIED IN TABLE 3-35). MAXIMUM LINE VOLUMES OF OVER 100,000 SHOULD BE RE-CHECKED FOR REASONABLENESS IN EVALUATING RIDERSHIP POTENTIALS OF NEW RAPID TRANSIT SYSTEMS.

SEVERAL ADDITIONAL FACTORS SHOULD BE TAKEN INTO ACCOUNT IN EVALUATING RAPID TRANSIT RIDERSHIP PROJECTIONS.

> APPROXIMATELY 65 TO 80 PERCENT OF THE TRIPS WILL HAVE ORIGINS OR DESTINATIONS IN THE CBD.
>
> APPROXIMATELY 25 TO 35 PERCENT OF ALL RIDERS WALK TO AND FROM STATIONS ON MOST EXISTING SYSTEMS (NEW YORK EXCLUDED). THIS RANGE MAY REDUCE TO 15 TO 25 PERCENT FOR PROPOSED "SUBURBAN ORIENTED" SYSTEMS.

FREEWAY VOLUMES - GUIDELINES FOR CHECKING THE AMOUNT OF TRAFFIC ASSIGNED TO FREEWAYS ARE SHOWN IN TABLES 7-1, 7-2, AND 7-4.

TABLE 7-1 SETS FORTH RANGES IN OBSERVED MAXIMUM FREEWAY VOLUMES FOR VARIOUS SIZED URBAN AREAS. IT IS CLEAR THAT FORECAST DAILY VOLUMES OF OVER 200,000 SHOULD BE CAREFULLY RE-CHECKED, SINCE THESE ARE LIKELY TO BE FOUND ONLY IN A FEW VERY LARGE CITIES TODAY.

---

(1) TABLE 11, URBAN TRANSPORTATION CONCEPTS, CENTER CITY TRANSPORTATION PROJECT, WILBUR SMITH AND ASSOCIATES, 1970.

CHAPTER 3

TRIP CHARACTERISTICS

INDEX TO CHAPTER 3

THERE IS NO RIGID ORGANIZATION OF TABLES WITHIN CHAPTER 3 AND ITS USE, FOR OTHER THAN BROWSING, IS DIFFICULT WITHOUT REFERENCE TO THIS INDEX.

(C) DENOTES VALUES NOT EXPLICITLY SHOWN IN TABLES BUT WHICH CAN EASILY BE COMPUTED.

ITEM	UNIT AND RATES	STRATIFIERS FIRST	STRATIFIERS SECOND	BASIS	TABLE
HOUSEHOLD SIZE	PERSON PER DWELLING			INDIVIDUAL CITIES	3-3
AUTO OWNERSHIP	PER PERSON AND PER DWELLING			INDIVIDUAL CITIES	3-3
TRIP RATES	PER PERSON AND PER HOUSEHOLD			INDIVIDUAL CITIES	3-3
TRIP RATES	TOTAL AND PER PERSON (C)			INDIVIDUAL CITIES	3-2
TRIP RATES	PER PERSON	AUTO PER PERSON		AVERAGE OF SELECTED CITIES	3-5
TRIP RATES	PER PERSON	AUTOS PER HOUSEHOLD	CITY SIZE AND MODE	AVERAGE OF SELECTED CITIES	3-6
TRIP RATES	PER HOUSEHOLD	AUTO PER HOUSEHOLD	INCOME	AVERAGE OF SELECTED CITIES	3-7
TRIP RATES	PER PERSON	AUTOS PER HOUSEHOLD	MODE	INDIVIDUAL CITIES	3-8
TRIP RATES	PER HOUSEHOLD	AUTO PER HOUSEHOLD	HOUSEHOLD SIZE	INDIVIDUAL CITIES AND AVERAGE	3-9
TRIP RATES	PER PERSON	PURPOSE	AGE OF TRIPMAKER	AVERAGE OF SELECTED CITIES	3-10
TRIP RATES	PER HOUSEHOLD	PURPOSE (C)	TOTAL	INDIVIDUAL CITIES	3-11
TRIP RATES	PER FLOOR AREA	LAND USE		AVERAGE OF SELECTED CITIES	3-12

ITEM	UNIT AND RATES	STRATIFIERS FIRST	STRATIFIERS SECOND	BASIS	TABLE
TRIP RATES	PER EMPLOYEE	LAND USE		AVERAGE OF SELECTED CITIES	3-12
TRIP RATES	PER CAPITA (C)			INDIVIDUAL CITIES	3-22
TRIP MILEAGE	PERSON MILES PER CAPITA			INDIVIDUAL CITIES	3-18
TRIP MILEAGE	VEHICLE MILES PER CAPITA AND PER AUTO			INDIVIDUAL CITIES	3-22
TRIP PURPOSES	PERCENT	PURPOSE		INDIVIDUAL CITIES	3-11
TRIP MODES	TRIPS AND PERCENT	MODE		INDIVIDUAL CITIES	3-1 3-2 3-3
TRIP MODES	PERCENT	AUTOS PER HOUSEHOLD	MODE	INDIVIDUAL CITIES	3-8
TRIP MODES	PERCENT BY TRANSIT	PURPOSE	AGE OF TRIPMAKER	AVERAGE OF SELECTED CITIES	3-10
TRIP LENGTH	AIRLINE MILES			INDIVIDUAL CITIES	3-18
TRIP LENGTH	AIRLINE MILES	MODE		INDIVIDUAL CITIES	3-19
TRIP LENGTH	AIRLINE MILES	CBD AND OTHER		INDIVIDUAL CITIES	3-20
TRIP LENGTH	AIRLINE MILES	PURPOSE		INDIVIDUAL CITIES	3-21 3-23
TRIP LENGTH (AUTO)	ROAD MILES	PURPOSE		INDIVIDUAL CITIES	3-21
TRIP LENGTH	ROAD MILES			INDIVIDUAL CITIES	3-22
TRIP DURATION	MINUTES	MODE	PURPOSE	INDIVIDUAL CITIES	3-24
TRIP DURATION (AUTO)	MINUTES	PURPOSE		INDIVIDUAL CITIES	3-25

ITEM	UNIT AND RATES	STRATIFIERS FIRST	STRATIFIERS SECOND	BASIS	TABLE
AUTO OCCUPANCY	PERSONS PER AUTO			INDIVIDUAL CITIES	3-2
AUTO OCCUPANCY	PERSONS PER AUTO	PURPOSE		INDIVIDUAL CITIES	3-13
CORRIDOR FLOWS	PERSON TRIPS	URBAN POPULATION	MODE	TYPICAL VALUES	3-35
CBD FLOWS	VARIES	URBAN POPULATION	MODE	TYPICAL VALUES	3-34
TIME OF DAY TRAVEL	PERCENT TRIPS BY HOUR	MODE		AVERAGE OF SELECTED CITIES	3-26
PEAKING OF TRAVEL	PERCENT TRIPS IN PEAK	MODE		INDIVIDUAL CITIES	3-27
PEAKING OF TRAVEL	PERCENT TRIPS IN PEAK	ROAD TYPE AND LOCATION	RADIAL OR CIRCUMFERENTIAL	AVERAGE OF SELECTED CITIES	3-32
DIRECTION OF TRAVEL	PERCENT IN MAJOR DIRECTION IN PEAK	MODE		INDIVIDUAL CITIES	3-27
DIRECTION OF TRAVEL	PERCENT IN MAJOR DIRECTION IN PEAK	ROAD TYPE AND LOCATION	RADIAL OR CIRCUMFERENTIAL	AVERAGE OF SELECTED CITIES	3-33
TRUCK TRIP RATES IN CBD	PER FLOOR AREA	LAND USE		AVERAGE OF SELECTED CITIES	3-30
TRUCK TRIP RATES	PER ACRE	LAND USE		AVERAGE OF SELECTED CITIES	3-29
TRUCK TRIPS	TOTAL AND PER CAPITA (C)			INDIVIDUAL CITIES	3-2
TRUCK TRIPS	PER TRUCK	TRUCK WEIGHT		AVERAGE OF SELECTED CITIES	3-14 3-28

ITEM	UNIT AND RATES	STRATIFIERS FIRST	STRATIFIERS SECOND	BASIS	TABLE
TRUCK MILEAGE	PER TRUCK	TRUCK		AVERAGE OF SELECTED CITIES	3-14 3-28
TRUCK USERS	PERCENT OF TRIPS AND MILES	INDUS-TRAIL USER CATEGORY		AVERAGE OF SELECTED CITIES	3-15
TRUCK TRIP PURPOSES	PERCENT	PURPOSE		AVERAGE OF SELECTED CITIES	3-16
TRUCK TRIP LENGTH	MILES	TRUCK WEIGHT		AVERAGE OF SELECTED CITIES	3-14 3-28
TRUCK TRIP LENGTH	MILES	TRUCK WEIGHT		INDIVIDUAL CITIES	3-17
TRUCK TRIP LENGTH	MILES			INDIVIDUAL CITIES	3-23
TRUCK TRIP DURATION	MINUTES			INDIVIDUAL CITIES	3-25
TRUCK TRIPS TIME OF DAY	PERCENT TRIPS BY HOUR	TRUCK WEIGHT		AVERAGE OF SELECTED CITIES	3-31

TABLE 3-1

TRAVEL MODES OF URBAN RESIDENTS

URBAN AREA	YEAR	STUDY AREA POPULATION	THOUSANDS OF PERSON TRIPS			% BY:	
			AUTO	TRANSIT	TOTAL	AUTO	TRANSIT
NEW YORK, NY (TRI-STATE)	1963	16,302,000	19,840	9,730	29,570	67.1	32.9
LOS ANGELES, CA	1967	9,008,400	19,819	759	20,578	96.3	3.7
CHICAGO, IL (EXPANDED AREA)	1970	7,593,000	15,961	2,655	18,616	85.7	14.3
CHICAGO, IL (1956 AREA)	1970	NA	10,974	1,976	12,950	84.7	15.3
CHICAGO, IL	1956	5,169,700	7,517	2,414	9,931	75.7	24.3
SAN FRANCISCO,CA	1965	4,400,000	8,953	933	9,886	90.6	9.4
DETROIT, MI	1965	4,041,809	9,357	452	9,809	95.4	4.6
PHILADELPHIA, PA	1960	4,007,000	6,477	1,283	7,760	83.5	16.5
BOSTON, MA	1963	3,584,400	6,351	1,500	7,851	80.2	19.8
DETROIT, MI	1953	2,968,900	4,385	879	5,264	83.3	16.7
WASHINGTON, DC	1968	2,714,000	5,222	657	5,879	88.8	11.2
PITTSBURGH, PA	1967	2,601,400	3,712	763	4,475	83.0	17.0
CLEVELAND, OH	1963	2,140,000	4,477	539	5,016	89.3	10.7
MINNEAPOLIS-ST. PAUL, MN	1970	1,874,400	4,933	162	5,095	96.2	3.8
DALLAS, TX	1964	1,821,000	5,062	198	5,260	96.2	3.8
TORONTO, ON	1964	1,800,000	3,124	753	3,877	80.6	19.4
MILWAUKEE, WI	1963	1,644,000	2,291	268	2,559	89.5	10.5
BALTIMORE, MD	1962	1,607,800	2,150	455	2,605	82.5	17.5
WASHINGTON, DC	1955	1,568,500	1,987	639	2,626	75.7	24.3
PITTSBURGH, PA	1958	1,472,100	1,895	482	2,377	79.7	20.3
CINCINNATI, OH	1965	1,392,000	2,738	287	3,025	90.6	9.4
MINNEAPOLIS-ST. PAUL, MN	1958	1,376,900	2,950	416	3,366	87.6	12.4
BUFFALO, NY	1962	1,350,000	2,476	284	2,760	90.3	9.7
SEATTLE, WA	1961	1,347,000	2,252	116	2,368	95.2	4.8
ST. LOUIS, MO	1957	1,275,500	2,090	387	2,477	84.4	15.6
MIAMI, FL	1964	1,187,000	2,391	165	2,556	93.6	6.4
HOUSTON, TX	1960	1,159,500	2,346	116	2,462	95.3	4.7
DENVER, CO	1971	1,116,000	3,097	58	3,155	98.2	1.8
SAN DIEGO, CA	1966	1,180,000	2,839	107	2,946	96.4	3.6
HOUSTON, TX	1953	878,600	1,701	252	1,953	87.1	12.9
KANSAS CITY, MO	1957	857,600	1,685	185	1,870	90.1	9.9
NEW ORLEANS, LA	1960	825,500	1,115	402	1,517	73.5	26.5
DENVER, CO	1960	806,100	1,736	83	1,819	95.5	4.5
SACRAMENTO, CA	1968	774,000	1,943	108	2,051	94.8	5.2
LOUISVILLE, KY	1964	752,000	1,279	78	1,357	94.3	5.7
INDIANAPOLIS, IN	1964	762,900	1,462	167	1,629	89.8	10.2
SAN JUAN, PR	1964	758,800	737	439	1,176	62.7	37.3
COLUMBUS, OH	1964	734,200	1,821	90	1,911	95.3	4.7
PORTLAND, OR	1960	715,100	1,624	144	1,768	91.9	8.1
ATLANTA, GA	1961	700,100	1,084	162	1,246	87.0	13.0
PROVIDENCE, RI	1961	658,600	1,319	85	1,404	94.0	6.0
MEMPHIS, TN	1964	647,700	1,345	85	1,430	94.1	5.9
SOUTHEAST, VA	1962	602,000	1,213	141	1,354	89.6	10.4

(NORFOLK)							
OKLAHOMA CITY,OK	1965	574,000	1,636	87	1,723	95.0	5.0
BIRMINGHAM, AL	1965	559,100	1,440	86	1,526	94.3	5.7
JACKSONVILLE, FL	1968	547,200	1,276	45	1,321	96.6	3.4
SPRINGFIELD, MA	1965	531,000	1,034	119	1,153	89.7	10.3
HONOLULU, HI	1960	480,100	1,127	131	1,258	89.6	10.4
RICHMOND, VA	1964	417,600	799	124	923	86.6	13.4
PHOENIX, AZ	1957	397,400	852	58	910	93.6	6.4
TAMPA-ST PETERS-BURG, FL	1965	395,700	908	19	927	97.9	2.1
S. LAKE CITY, UT	1960	394,300	924	54	978	94.5	5.5
NASHVILLE, TN	1959	357,600	756	63	819	92.3	7.7
ORLANDO, FL	1965	355,600	899	23	922	97.5	2.5
LEHIGH VALLEY,PA	1964	345,100	629	59	688	91.4	8.6
FRESNO-CLOVIS,CA	1971	295,400	857	32	889	96.4	3.6
MOBILE, AL	1966	279,700	755	15	770	98.0	2.0
PEORIA, IL	1964	260,800	782	10	792	98.7	1.3
BATON ROUGE, LA	1965	245,100	568	47	615	92.3	7.7
TUCSON, AZ	1960	244,500	552	27	579	95.3	4.7
CHATTANOOGA, TN	1960	241,800	486	39	525	92.6	7.4
SOUTH BEND, IN	1967	222,100	636	39	675	94.3	5.7
F.LAUDERDALE, FL	1959	211,000	352	5	357	98.6	1.4
CHARLOTTE, NC	1958	202,300	443	35	478	92.7	7.3
COLUMBIA, SC	1964	196,000	496	36	532	93.3	6.7
STOCKTON, CA	1967	170,000	401	18	419	95.8	4.2
SPRINGFIELD, IL	1964	137,800	318	15	333	95.6	4.4
RENO, NV	1955	55,000	134	2	136	98.5	1.5
LONDON, ENGLAND	1961	8,826,600	6,622	7,774	14,396	46.0	54.0
BOMBAY, INDIA	1962	4,345,200	810	1,890	2,700	30.0	70.0
ATHENS, GREECE	1962	1,900,000	1,120	2,080	3,200	35.0	65.0
BRISBANE, AUST.	1960	593,700	556	455	1,011	55.0	45.0

NOTES: NA - NOT AVAILABLE.
SCHOOL BUS INCLUDED WITH TRANSIT WHERE IDENTIFIED.
SOME URBAN AREAS APPEAR AT TWO DATES.

SOURCE: COMPREHENSIVE URBAN TRANSPORTATION PLANNING STUDIES.

TABLE 3-2

TRAVEL MODES, CAR OCCUPANCIES AND TRUCK TRIPS
SELECTED URBAN AREAS

URBAN AREA	YEAR	STUDY AREA POPULATION	THOUSANDS OF PERSON TRIPS			
			AUTO DRIVER	AUTO TRUCK TAXI PASS.	TRANSIT PASS.	TOTAL
LOS ANGELES	1967	9,008,400	14,098	5,721	759	20,578
CHICAGO	1956	5,169,700	4,812	2,705	2,414	9,931
DETROIT	1965	4,041,800	6,439	2,918	452	9,809
PHILADELPHIA	1960	4,007,000	4,309	2,168	1,283	7,760
BOSTON	1963	3,584,400	4,444	1,907	1,500	7,851
DETROIT	1953	2,968,900	2,991	1,394	879	5,264
WASHINGTON	1968	2,714,000	3,407	1,815	657	5,879
PITTSBURGH	1967	2,601,400	2,528	1,184	763	4,475
MINNEAPOLIS-ST. PAUL	1970	1,874,400	3,014	1,919	162	5,095
DALLAS	1964	1,821,000	3,338	1,724	198	5,260
TORONTO	1964	1,800,000	2,244	880	753	3,877
BALTIMORE	1962	1,607,800	1,426	724	455	2,605
WASHINGTON	1955	1,568,500	1,278	709	639	2,626
PITTSBURGH	1958	1,472,100	1,292	603	482	2,377
BUFFALO	1962	1,350,000	1,588	888	284	2,760
ST. LOUIS	1957	1,275,500	1,359	731	387	2,477
CINCINNATI	1965	1,392,000	1,759	979	287	3,025
MIAMI	1964	1,187,300	1,533	858	165	2,556
HOUSTON	1953	878,600	1,085	616	252	1,953
KANSAS CITY	1957	657,600	1,108	577	185	1,870
INDIANAPOLIS	1964	762,900	1,011	451	167	1,629
ATLANTA	1961	700,000	735	349	162	1,246
SOUTHEAST VIRGINIA	1962	602,000	799	414	141	1,354
OKLAHOMA CITY	1965	574,000	1,077	559	87	1,723
BIRMINGHAM	1965	559,100	961	479	86	1,526
SPRINGFIELD (MA)	1965	531,000	725	309	119	1,153
HONOLULU	1960	480,100	644	483	131	1,258
RICHMOND	1964	417,600	542	257	124	923
PHOENIX	1957	397,400	586	266	58	910
SALT LAKE CITY	1960	394,300	624	300	54	978
NASHVILLE	1959	357,600	493	263	63	819
ORLANDO	1965	355,600	594	305	23	922
LEHIGH VALLEY (PA)	1964	345,100	443	186	59	688
MOBILE	1966	279,700	450	305	15	770
PEORIA	1964	260,800	489	293	10	792
BATON ROUGE	1965	245,000	380	188	47	615
CHATTANOOGA	1960	241,800	312	174	39	525
FORT LAUDERDALE	1959	211,000	238	114	5	357
CHARLOTTE	1958	202,300	303	140	35	478
COLUMBIA (SC)	1964	196,000	330	166	36	532
RENO	1955	55,000	81	53	2	136

NOTES: SCHOOL BUS INCLUDED WITH TRANSIT.
SOME URBAN AREAS APPEAR AT TWO DATES.
NA - NOT AVAILABLE.

SOURCE: COMPREHENSIVE URBAN AREA TRANSPORTATION PLANNING STUDIES.

TABLE 3-2
(CONTINUED)

TRAVEL MODES, CAR OCCUPANCIES AND TRUCK TRIPS
SELECTED URBAN AREAS

URBAN AREA	YEAR	PERCENTAGE BY: AUTO	PERCENTAGE BY: TRANSIT	AVERAGE CAR OCCUPANCY	TRUCK TRIPS	TOTAL VEHICLE TRIPS	PER CENT TRUCKS
LOS ANGELES	1967	96.3	3.7	1.41	1,612	15,710	10.2
CHICAGO	1956	75.7	24.3	1.56	828	5,639	14.7
DETROIT	1965	95.4	4.6	1.45	920	7,359	12.5
PHILADELPHIA	1960	83.5	16.5	1.50	990	5,299	18.6
BOSTON	1963	80.2	19.8	1.43	878	5,322	16.4
DETROIT	1953	83.3	16.7	1.46	495	3,486	14.2
WASHINGTON	1968	88.3	11.2	1.53	446	3,853	11.6
PITTSBURGH	1967	83.0	17.0	1.44	449	2,977	15.1
MINNEAPOLIS-ST. PAUL	1970	96.2	3.8	1.64	489	3,503	14.0
DALLAS	1964	96.2	3.8	1.52	418	3,755	11.1
TORONTO	1964	80.6	19.4	1.44	NA	NA	NA
BALTIMORE	1962	82.5	17.5	1.50	378	1,804	20.9
WASHINGTON	1955	65.7	24.3	1.56	219	1,497	14.6
PITTSBURGH	1958	79.7	20.3	1.47	229	1,521	15.1
BUFFALO	1962	89.8	10.2	1.56	208	1,796	11.6
ST. LOUIS	1957	84.4	15.6	1.54	280	1,639	17.1
CINCINNATI	1965	90.6	9.4	1.55	397	2,146	18.4
MIAMI	1964	93.6	6.4	1.56	163	1,696	9.6
HOUSTON	1953	87.1	12.9	1.57	202	1,287	15.7
KANSAS CITY	1957	90.1	9.9	1.52	181	1,289	14.0
INDIANAPOLIS	1964	89.8	10.2	1.45	175	1,186	14.8
ATLANTA	1961	87.0	13.0	1.47	NA	NA	NA
SOUTHEAST VIRGINIA	1962	89.6	10.4	1.52	119	918	11.3
OKLAHOMA CITY	1965	95.0	5.0	1.52	148	1,255	12.0
BIRMINGHAM	1965	94.3	5.7	1.51	NA	NA	NA
SPRINGFIELD (MA)	1965	89.7	10.3	1.43	81	806	10.0
HONOLULU	1960	89.6	10.4	1.75	NA	NA	NA
RICHMOND	1964	86.6	13.4	1.47	94	636	14.7
PHOENIX	1957	93.6	6.4	1.45	168	754	22.2
SALT LAKE CITY	1960	94.5	5.5	1.47	138	762	18.1
NASHVILLE	1959	92.3	7.7	1.54	91	564	15.6
ORLANDO	1965	97.5	2.5	1.51	84	678	12.3
LEHIGH VALLEY (PA)	1964	91.4	8.6	1.42	82	525	15.6
MOBILE	1966	98.0	2.0	1.57	87	543	16.0
PEORIA	1964	98.7	1.3	1.60	65	554	11.7
BATON ROUGE	1965	92.3	7.7	1.49	90	470	19.0
CHATTANOOGA	1960	92.6	7.4	1.46	64	376	17.0
FORT LAUDERDALE	1959	98.6	1.4	1.48	32	259	12.0
CHARLOTTE	1958	92.7	7.3	1.46	52	355	14.6
COLUMBIA (SC)	1964	93.3	6.7	1.50	52	382	13.6
RENO	1955	98.5	1.5	1.68	22	103	21.4

NOTES: SCHOOL BUS INCLUDED WITH TRANSIT.
SOME URBAN AREAS APPEAR AT TWO DATES.
NA - NOT AVAILABLE.

SOURCE: COMPREHENSIVE URBAN AREA TRANSPORTATION PLANNING STUDIES.

TABLE 3-3

GENERATION OF TRAVEL BY URBAN RESIDENTS
IN SELECTED AMERICAN CITIES

URBAN AREA	YEAR	STUDY AREA POPULATION	TRIPS PER PERSON	PERSONS PER CAR	TRIPS PER DWELLING	PERSONS PER DWELLING	CARS PER DWELLING	% OF PERSON TRIPS BY CAR
NEW YORK, NY (TRI-STATE)	1963	16,302,000	1.81	3.89	5.61	3.09	0.79	67.1
LOS ANGELES, CA	1967	9,008,000	2.28	2.29	6.68	2.93	1.28	96.3
CHICAGO, IL	1970	7,593,000	2.45	2.83	7.20	2.94	1.04	85.7
CHICAGO, IL	1956	5,170,000	1.92	3.85	5.96	3.10	0.80	75.7
S. FRANCISCO, CA	1965	4,400,000	2.25	--	--	--	--	90.6
DETROIT, MI	1965	4,042,000	2.43	2.67	8.56	3.53	1.32	95.4
PHILADELPHIA, PA	1960	4,007,000	2.03	3.69	6.26	3.08	0.84	83.5
BOSTON, MA	1963	3,584,000	2.23	3.36	7.33	3.30	0.98	80.2
DETROIT, MI	1953	2,969,000	1.77	3.51	5.88	3.31	0.94	83.3
WASHINGTON, DC	1968	2,714,000	2.17	2.58	7.19	3.32	1.29	88.8
PITTSBURGH, PA	1967	2,601,000	1.72	3.02	5.71	3.32	1.10	83.0
CLEVELAND, OH	1963	2,140,000	2.34	2.88	7.72	3.29	1.14	89.3
MINNEAPOLIS-ST. PAUL, MN	1970	1,874,000	2.72	2.62	8.02	3.27	1.25	96.2
DALLAS, TX	1964	1,821,000	2.89	2.50	8.92	3.09	1.24	96.2
MILWAUKEE, WI	1963	1,644,000	2.07	3.10	7.05	3.41	1.12	89.5
BALTIMORE, MD	1962	1,608,000	1.66	3.61	5.56	3.34	0.92	82.5
WASHINGTON, DC	1955	1,568,000	1.67	3.75	5.05	3.02	0.81	75.7
PITTSBURGH, PA	1958	1,472,000	1.61	3.75	5.26	3.26	0.87	79.7
CINCINNATI, OH	1965	1,392,000	2.17	2.87	7.17	3.30	1.15	80.6
MINNEAPOLIS-ST. PAUL, MN	1958	1,377,000	2.45	3.15	8.25	3.37	1.07	87.6
BUFFALO, NY	1962	1,350,000	2.04	3.86	7.65	3.74	0.97	90.3
SEATTLE, WA	1961	1,347,000	1.76	2.76	5.32	3.02	1.09	95.2
ST. LOUIS, MO	1957	1,276,000	1.94	3.48	6.05	3.12	0.90	84.4
MIAMI, FL	1964	1,187,000	2.16	3.10	7.77	3.61	1.16	93.6
HOUSTON, TX	1960	1,160,000	2.12	2.72	7.89	3.72	1.37	95.3
DENVER, CO	1971	1,116,000	2.83	2.21	8.76	3.10	1.40	98.2
SAN DIEGO, CA	1966	1,103,000	2.67	2.38	7.40	2.77	1.16	96.4
HOUSTON, TX	1953	879,000	2.22	3.43	7.16	3.22	0.94	87.1
KANSAS CITY, MO	1957	858,000	2.18	3.26	6.69	3.07	0.95	90.1
NEW ORLEANS, LA	1960	825,000	1.83	4.00	6.22	3.38	0.84	74.6
DENVER, CO	1960	806,000	2.26	2.83	7.74	3.43	1.21	95.5
SACRAMENTO, CA	1968	774,000	2.65	NA	7.56	2.85	NA	94.8
INDIANAPOLIS, IN	1964	763,000	2.14	2.79	6.60	3.10	1.11	89.8
SAN JUAN, PR	1964	759,000	1.53	5.02	7.51	4.85	0.99	62.7
LOUISVILLE, KY	1964	752,000	1.93	3.02	6.30	3.26	1.08	94.3
COLUMBUS, OH	1964	734,000	2.60	2.78	8.45	3.25	1.17	95.3
PORTLAND, OR	1960	715,000	2.47	2.72	7.64	3.09	1.13	91.9
ATLANTA, GA	1961	700,000	1.78	3.14	5.41	3.04	0.97	82.0
PROVIDENCE, RI	1960	686,000	2.05	3.37	7.00	3.42	1.01	94.0
NORFOLK, VA (SE)	1962	602,000	2.25	3.54	7.37	3.27	0.93	89.6
BIRMINGHAM, AL	1965	559,000	2.68	2.78	8.96	3.34	1.19	94.3
OKLAHOMA CITY,OK	1965	574,000	3.00	2.49	9.51	3.17	1.27	95.0

JACKSONVILLE, FL	1968	547,000	2.41	2.70	7.83	3.25	1.20	96.6
SPRINGFIELD, MA	1965	531,000	2.25	3.14	7.05	3.13	1.00	89.7
HONOLULU, HI	1960	480,000	2.62	3.57	9.13	3.48	0.98	89.6
F.LAUDERDALE, FL	1964	450,000	2.66	2.33	7.53	2.83	1.22	--
RICHMOND, VA	1964	418,000	2.33	3.04	7.57	3.33	1.07	86.6
PHOENIX, AZ	1957	397,000	2.29	2.87	6.88	3.01	1.05	93.6
S. LAKE CITY, UT	1960	394,000	2.46	3.88	9.00	3.51	1.22	94.5
NASHVILLE, TN	1959	358,000	2.29	3.35	7.52	3.28	0.98	92.3
ORLANDO, FL	1965	356,000	2.59	2.59	8.39	3.24	1.25	97.5
LEHIGH VALLEY,PA	1964	345,000	2.00	2.84	6.40	3.21	1.13	91.4
FRESNO-CLOVIS,CA	1972	295,000	3.00	2.27	8.25	2.74	1.21	96.4
MOBILE, AL	1966	280,000	1.79	2.94	6.42	3.59	1.21	98.0
W.PALM BEACH, FL	1965	261,000	2.58	2.44	7.46	2.89	1.19	--
PEORIA, IL	1964	261,000	3.03	2.72	9.74	3.21	1.18	98.7
BATON ROUGE, LA	1965	245,000	2.50	2.85	8.76	3.23	1.13	92.3
TUCSON, AZ	1960	244,000	2.39	2.78	2.70	3.22	1.17	95.3
CHATTANOOGA, TN	1960	242,000	2.03	3.31	7.58	3.33	1.01	92.6
KNOXVILLE, TN	1962	242,000	2.50	3.09	8.08	3.22	1.04	94.7
LITTLE ROCK, AR	1964	223,000	3.09	3.05	9.89	3.20	1.10	95.7
SOUTH BEND, IN	1967	222,000	3.04	2.45	9.24	3.04	1.24	94.3
F.LAUDERDALE, FL	1959	211,000	1.69	2.72	3.63	2.15	0.79	98.6
CHARLOTTE, NC	1958	202,000	2.36	3.28	8.10	3.43	1.05	92.7
COLUMBIA, SC	1964	196,000	2.96	2.83	9.42	3.17	1.12	93.3
EVANSVILLE, IN	1970	175,000	3.29	2.23	10.17	3.09	1.39	NA
MADISON, WI	1962	169,000	2.25	3.00	7.10	3.14	1.05	NA
HUNTSVILLE, AL	1964	123,000	2.87	2.52	9.20	3.21	1.27	94.5
LEXINGTON, KY	1961	119,000	2.14	2.93	6.84	3.19	1.09	NA
RAPID CITY, SC	1963	73,000	2.45	2.75	7.41	3.15	1.14	97.9
RENO, NV	1955	55,000	2.48	2.43	6.87	2.77	1.14	98.5

NOTES: NA - NOT AVAILABLE.
SOME URBAN AREAS APPEAR AT TWO DATES.

SOURCE: COMPUTED FROM TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-4

PERSON TRIPS PER HOUSEHOLD
IN RELATION TO CAR OWNERSHIP

CITY	YEAR	CARS PER HOUSEHOLD 0	1	2	3+
CHICAGO, IL	1970	2.15	7.18	12.28	17.75
CINCINNATI, OH	1972	1.97	6.50	11.65+	
FRESNO, CA	1971	1.34	6.68	11.99+	
KENOSHA, WI	1963	1.20	7.73	11.42+	
LOS ANGELES, CA	1967	1.20	5.80	10.70	
MILWAUKEE, WI	1963	2.00	7.22	11.13	14.03
MINNEAPOLIS, MN	1970	2.63	7.82	13.40+	
MONTEREY, CA	1970	1.25	6.57	11.95+	
OKLAHOMA CITY, OK	1965	2.70	8.80	12.70	15.40
PUGET SOUND, WA	1961	1.40	6.90	11.00	14.00
RICHMOND, VA	1964	2.67	7.62	11.40	13.84
SAN DIEGO, CA	1966	1.40	6.10	12.10+	
SAN FRANCISCO, CA	1965	1.89	6.52	9.69	12.60
WASHINGTON, DC	1968	2.08	5.88	9.67	10.60
AVERAGE		1.84	6.95	11.50	14.03

SOURCE: TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-5

RANGES OF OVERALL PERSON-TRIP GENERATION
(AREA-WIDE)
1970-1976 CONDITIONS

PERSONS/CAR	AVERAGE TRIPS/PERSON/DAY	
	RANGE	TYPICAL
2.0	2.5 - 3.5	(3.0)
2.5	2.1 - 3.1	(2.6)
3.0	1.8 - 2.8	(2.3)
3.5	1.6 - 2.6	(2.1)
4.0	1.5 - 2.5	(2.0)

SOURCE: ESTIMATED - BASED ON COMPREHENSIVE URBAN TRANSPORTATION STUDIES, (SEE TABLE 3-3).

TABLE 3-6

GENERALIZED TRIPS PER PERSON AND TRAVEL MODE
STRATIFIED BY CAR OWNERSHIP

	CARS PER HOUSEHOLD		
	0	1	2+
LARGE CITY			
TOTAL TRIPS	1.0	2.0	3.0
TRANSIT TRIPS	0.7	0.3	0.2
MEDIUM-SIZE CITY			
TOTAL TRIPS	1.0	2.3	3.3
TRANSIT TRIPS	0.4	0.2	0.1
SMALL CITY			
TOTAL TRIPS	1.0	2.5	3.5
TRANSIT TRIPS	0.3	0.1	0.1
RANGE OF TOTAL TRIPS(1)	0.7 - 1.6	1.7 - 2.8	2.4 - 3.5

(1) 10 CITIES IN U.S.

SOURCE: COMPUTED FROM COMPREHENSIVE URBAN TRANSPORTATION STUDIES.

TABLE 3-7

NATIONWIDE PERSONAL TRANSPORTATION STUDY 1969
TOTAL PERSON TRIPS PER HOUSEHOLD

	AUTOS			
INCOME (DOLLARS)	0	1	2	3+
0-2,999	1.1	3.5	5.5	-
3-3,999	2.2	4.8	8.9	-
4-4,999	2.2	5.8	9.3	12.0
5-5,999	2.4	5.3	7.8	12.3
6-7,499	2.8	6.5	8.0	10.6
7.5-9,999	3.2	7.3	9.3	12.8
10-14,999	2.8	7.0	8.7	12.1
15+	3.3	6.1	10.5	13.0

SOURCE: FHWA TRIP GENERATION ANALYSIS, 1975. DERIVED FROM REPORT 11, "NATIONAL PERSONAL TRANSPORTATION STUDY", FEDERAL HIGHWAY ADMINISTRATION, WASHINGTON, D.C., DECEMBER 1974, PAGE 56, TABLE 26.

TABLE 3-8

EFFECT OF CAR OWNERSHIP ON TRIP GENERATION AND TRAVEL MODE IN SELECTED URBAN AREAS

ITEM	CARS PER DWELLING UNIT 0	1	2	3+	ALL
TOTAL TRIPS PER PERSON					
CHICAGO	0.78	1.76	2.92(1)		1.92(3)
SAN FRANCISCO	0.99	2.17	2.63	3.03	NA
DETROIT	0.70	2.08	3.20(1)		1.77
MINNEAPOLIS	1.60	2.83	3.51		NA
PITTSBURGH	1.12	1.70	2.40(1)		1.61
SEATTLE	0.90	2.60	3.20	3.40	2.66
INDIANAPOLIS	0.93	2.13	2.86	2.25	
SAN JUAN	0.99	2.00	3.28(1)		1.69
SPRINGFIELD (MA)	0.71	2.27	3.13(1)		2.27
KNOXVILLE	0.85	2.49	3.36	3.87	2.51
LEXINGTON	0.76	2.06	2.91	3.26	2.13
TRANSIT TRIPS PER PERSON					
CHICAGO	0.62	0.36	0.31(1)		0.47
SAN FRANCISCO	0.61	0.20	0.14	0.12	
DETROIT	0.42	0.25	0.24(1)		0.30
MINNEAPOLIS	0.42	0.09	0.04		
PITTSBURGH	0.74	0.38	0.2(1)		0.32
SEATTLE	0.37	0.12	0.06	0.06	NA(2)
INDIANAPOLIS	0.32	0.09	0.04	0.10	
SAN JUAN	0.73	0.38	0.24(1)		0.53
SPRINGFIELD (MA)	0.20	0.07	0.04(1)		0.08
KNOXVILLE	0.32	0.09	0.04	0.03	0.11
LEXINGTON	0.28	0.10	0.07	0.05	0.12
PER CENT OF PERSON TRIPS BY TRANSIT					
CHICAGO	79.7	20.3	10.5(1)		24.3
SAN FRANCISCO	61.6	9.2	5.3	4.0	
DETROIT	59.7	12.1	7.4(1)		16.7
MINNEAPOLIS	26.3	3.2	1.1		
PITTSBURGH	64.3	17.6	10.8(1)		21.7
SEATTLE	41.3	4.6	2.0	1.8	NA(2)
INDIANAPOLIS	34.4	4.2	0.02	0.04	
SAN JUAN	73.3	18.9	7.3(1)		31.1
SPRINGFIELD (MA)	28.7	3.1	1.2(1)		3.6
KNOXVILLE	37.4	3.5	1.1	0.8	4.3
LEXINGTON	36.9	4.7	2.3	1.6	5.4

(1) TWO OR MORE CARS PER DWELLING UNIT.
(2) NOT AVAILABLE.
(3) 1956 DATA SHOWN. 1970 DATA FOR CHICAGO: 0 CARS, 1.08; 1 CAR, 2.61; 2 CARS, 3.46; 3+ CARS, 4.01.

SOURCE: COMPUTED FROM ORIGIN-DESTINATION STUDIES IN EACH URBAN AREA. DATA MAY VARY SLIGHTLY FROM THAT SET FORTH IN OTHER TABULATIONS. FOR PUGET SOUND AND MINNEAPOLIS, DATA ARE BASED ON PERSONS OVER FIVE YEARS OLD IN HOUSEHOLDS.

TABLE 3-9

PERSON TRIPS PER DWELLING UNIT
BASED ON CAR OWNERSHIP AND HOUSEHOLD SIZE

HOUSEHOLD SIZE	CHICAGO 1956	CHICAGO 1970	PUGET SOUND 1961	FHWA BASED ON MADISON, WI 1962	AVERAGE TRIPS/DU	AVERAGE TRIPS/PERSON
0 CARS/DU						
1	1.8	1.5	0.9	1.0	1.3	1.3
2	2.9	2.4	1.8	1.5	2.2	1.1
3	4.0	3.5	3.5	3.1	3.5	1.2
4	4.7	2.7	3.5	3.2	3.5	0.9
5(1)	5.7	3.3	4.3	5.2	4.6	0.9
6-7(2)			-	-		
8 OR MORE			-	-		
ALL	3.0	2.1	1.4	1.6	2.0	-
1 CAR/DU						
1	3.5	3.6	3.2	2.7	3.3	3.3
2	5.5	5.7	5.1	5.1	5.5	2.8
3	7.2	7.6	7.8	7.2	7.4	2.5
4	8.9	8.8	10.0	8.0	8.9	2.2
5(1)	10.2	10.5	11.5	9.2	10.3	2.1
6-7(2)			12.6	-	12.6	1.9
8 OR MORE			15.1	-	15.1	2.2
ALL	6.9	6.7	6.9	6.6	6.8	-
2 CARS/DU						
1	-	-	3.5	4.4	4.0	4.6
2	7.7	8.1	7.3	7.0	6.8	3.4
3	9.8	10.3	10.2	9.4	9.9	3.3
4	12.0	13.8	12.9	11.7	12.6	3.2
5(1)	13.8	17.3	15.0	13.4	14.9	3.0
6-7 (2)			17.2		17.2	2.6
8 OR MORE			21.9		21.9	3.1
ALL	10.9	12.0	11.0	10.9(2)	11.3	-
3 CARS/DU						
1						-
2	-		9.9		9.9	5.0
3	10.9	12.3	11.1		11.4	3.8
4	13.9	14.6	13.7		14.1	3.5
5(1)	16.4	22.0	17.2		18.5	3.7
6-7(2)			18.6		18.6	2.9
8 OR MORE			23.6		23.6	3.0
ALL	14.5	16.8	14.0		15.1	-

(1) OR MORE, EXCEPT FOR PUGET SOUND AND FHWA-MADISON COLUMNS.
(2) 6.5 USED.

(3) DATA FOR MADISON SHOWN FOR 2 OR MORE CARS.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-10

EFFECTS OF AGE ON TRIP PURPOSE AND FREQUENCY

AVERAGE PERCENTAGE OF TRIPS MADE BY TRANSIT FOR SIX SELECTED CITIES BY AGE

	HOME-BASED TRIP PURPOSES			
AGE	WORK	SHOP	MISC.	ALL PURPOSES
5-14	5.6	2.2	1.4	1.6
15-24	11.2	4.3	2.7	2.1
25-34	5.9	1.6	1.0	0.8
35-44	7.8	2.2	1.3	0.9
45-54	8.4	2.8	1.5	1.1
55-64	11.2	5.4	3.5	2.2
65 AND OVER	11.3	8.2	6.9	2.7
AVERAGE ALL AGES	9.2	3.8	2.6	1.6

AVERAGE TOTAL PERSON TRIPS GENERATED PER TRIPMAKER PER DAY FOR SIX SELECTED CITIES BY AGE

	HOME-BASED TRIP PURPOSES				
AGE	WORK	SHOP	SCHOOL	MISC.	ALL PURPOSES
5-14	.02	.24	.62	1.29	2.17
15-24	.51	.33	.34	1.00	2.18
25-34	.82	.48	.02	1.01	2.33
35-44	.89	.47	.01	1.04	2.41
45-54	.97	.44	0	.97	2.38
55-64	.92	.45	0	.95	2.32
65+	.38	.66	0	1.23	2.27
UNWEIGHTED AVERAGE	.65	.44	.14	1.06	2.32

SOURCE: ASHFORD, NORMAN AND HALLOWAY, FRANK M., "THE EFFECTS OF AGE ON URBAN TRAVEL BEHAVIOR", TRAFFIC ENGINEERING, APRIL, 1971.

TABLE 3-11

HOME-BASED TRIPS BY URBAN RESIDENTS ACCORDING TO PURPOSE

URBAN AREA (YEAR)	POPULATION (000'S)	HOME-BASED TRIPS AS % OF ALL LINKED TRIPS	PERCENT OF HOME-BASED TRIPS TO AND FROM: WORK	BUSINESS	SHOPPING	SOCIAL/RECREATIONAL	SCHOOL	OTHER	TOTAL HOME-BASED TRIPS /DU
LOS ANGELES, CA (1967)	9,008	73.6	30.4	--	17.6	--	--	52.0	4.70
CHICAGO, IL (1956)	5,170	86.8	37.5	9.7	18.9	22.8	4.0	7.1	5.17
SAN FRANCISCO, CA (1965)	4,400	79.2	23.3	--	16.1	--	--	60.6	6.94
DETROIT, MI (1965)	4,042	77.6	20.8	22.2	19.8	22.2	17.0	--	6.64
PHILADELPHIA, PA (1960)	4,007	85.4	34.8	9.8	12.7	17.1	6.6	19.0	3.90
BOSTON, MA (1963)	3,584	81.0	28.3	9.9	17.5	17.0	11.5	15.8	5.30
DETROIT, MI (1953)	2,969	87.0	41.6	8.6	13.9	20.1	6.3	9.5	4.67
WASHINGTON, DC (1968)	2,714	87.2	28.0	15.6	23.4	17.7	8.0	7.3	6.30
TORONTO, CANADA(1964)	1,800	88.7	48.5	8.9	17.3	16.2	4.6	4.5	5.64
MILWAUKEE, WI (1963)	1,644	82.8	32.8	15.2	16.7	13.6	9.6	12.1	5.44
BALTIMORE, MD (1962)	1,608	88.0	39.7	8.1	15.1	15.6	12.0	9.5	4.58
WASHINGTON, DC (1955)	1,568	91.6	43.1	9.6	14.2	12.5	9.4	11.2	4.23
PITTSBURGH, PA (1958)	1,472	87.0	37.7	21.6	14.9	13.8	12.0	--	4.21
CINCINNATI, OH (1965)	1,392	77.7	30.6	--	19.3	22.4	10.1	17.6	5.57
SEATTLE, WA (1962)	1,347	79.9	27.8	14.7	16.5	20.9	9.2	10.9	3.82
ST. LOUIS, MO (1957)	1,276	91.3	37.5	8.1	17.3	21.5	6.4	9.2	4.90
MIAMI, FL (1964)	1,187	83.7	23.6	8.0	21.0	20.8	11.4	15.2	6.50
DENVER, CO (1971)	1,116	79.2	23.3	--	16.1	--	--	67.6	6.94
SAN DIEGO, CA (1966)	1,103	70.6	23.5	--	19.5	--	--	51.0	5.22
HOUSTON, TX (1953)	879	91.0	33.1	8.9	17.3	18.6	10.8	11.3	5.51
DENVER, CO (1960)	806	83.1	29.3	12.8	15.5	21.1	11.1	10.2	5.23

SACRAMENTO, CA (1968)	774	73.9	26.1	--	17.3	--	--	56.6	4.06
INDIANAPOLIS, IN (1964)	763	78.5	34.2	--	17.6	--	12.5	35.7	5.63
ATLANTA, GA (1961)	700	83.5	34.6	--	15.6	13.7	12.5	23.6	4.52
SE VIRGINIA (NORFOLK)(1962)	602	81.8	31.6	12.5	20.2	23.8	11.9	--	6.22
OKLAHOMA CITY, OK (1965)	574	73.0	26.4	9.6	20.8	27.4	15.8	--	7.89
BIRMINGHAM, AL (1965)	559	76.6	23.4	35.5	18.0	14.0	9.1	--	6.50
SPRINGFIELD, MA (1965)	551	81.1	30.1	9.6	16.5	18.3	13.6	11.9	5.37
HONOLULU, HI (1960)	480	76.3	27.1	6.3	15.9	28.9	10.2	11.6	7.26
RICHMOND, VA (1964)	418	80.3	34.2	13.0	16.6	18.1	11.0	7.1	5.51
PHOENIX, AZ (1957)	397	85.3	25.2	10.2	19.7	20.0	11.6	13.3	4.76
SALT LAKE CITY, UT (1960)	394	85.0	22.9	4.8	18.4	28.7	8.1	17.1	6.99
NASHVILLE, TN (1959)	358	85.5	30.3	8.5	16.9	23.9	7.4	13.0	5.48
LEHIGH VALLEY, PA (1964)	345	77.8	31.0	11.8	15.9	14.8	13.2	13.3	5.20
FRESNO, CA (1971)	295	69.3	24.8	--	18.3	--	--	56.9	5.94
PEORIA, IL (1964)	261	77.5	22.4	--	22.0	--	--	55.6	7.51
KNOXVILLE, TN (1962)	242	79.5	25.9	11.1	23.8	30.9	8.3	--	6.42
LITTLE ROCK, AR (1964)	223	83.2	25.8	8.9	20.1	31.2	14.0	--	8.23
FT. LAUDERDALE, FL (1959)	211	86.5	27.9	15.3	24.0	22.9	0.9	9.0	2.82
CHARLOTTE, NC (1958)	202	83.9	32.2	8.0	15.6	23.8	6.6	13.8	5.56
COLUMBIA, SC (1964)	196	77.5	25.3	7.9	16.9	20.2	14.9	14.8	6.60
RENO, NV (1958)	55	86.5	29.2	12.7	18.1	26.3	0.5	13.2	4.88

NOTES: SOME URBAN AREAS APPEAR AT TWO DATES.

SOURCE: COMPUTED FROM TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-12

ILLUSTRATIVE NON-RESIDENTIAL
PERSON TRIP DESTINATIONS

LAND USE	TRIPS PER 1000 SQ. FT. OF FLOOR SPACE	TRIPS PER EMPLOYEE	TRIPS PER OTHER	ASSUMED PERSONS/ CAR	ASSUMED APPROX. % BY CAR	(3) TYPE TRIPS
1. COMMERCIAL						
A. REGIONAL SHOPPING CENTERS (SQ. FT.)						
< 250,000	54	25		1.8	100	1,2
250-500,000	45	20		2.0	100	1,2
500-1,000,000	35	20		2.0	90	1,2
OVER 1,000,000	33	17		2.0	90	1,2
B. OFFICES						
GENERAL	6.5	1.6		1.3	50-90(2)	1,4
GOVERNMENTAL	19.5	3.9		1.3	50-90(2)	1,4
MEDICAL/DENTAL	37.5	9.4		1.5	80-90	1,4
2. INDUSTRIAL						
A. GENERAL-MANUFACTURING		1.5		1.3	90-100	1
B. INDUSTRIAL PARKS		2.4		1.3	100	1,4
3. RECREATIONAL						
A. PARKS		(1)	38/ACRE	3.0	100	3
B. SPORTS STADIUM			0.8-1.0/SEAT	3.0	80-100	3
4. EDUCATIONAL						
UNIVERSITIES		(1)	1.8/STUDENT	1.5	70-85	1,5
HIGH SCHOOLS		(1)	0.9/STUDENT	1.5	70-85	1,5
ELEMENTARY SCHOOLS		(1)	0.5/STUDENT	1.5	70-85	1,5
5. HOSPITALS		(1)	4.5/BED	1.5	80-90	1,4

(1) USE EMPLOYEES TO ESTIMATE WORK TRIPS.

(2) UPPER RANGE - CBD.

(3) TRIP TYPES:

1 - WORK
2 - SHOP
3 - SOCIAL-RECREATION
4 - PERSONAL BUSINESS
5 - SCHOOL

NOTE: (OCCUPANCY) X (TRIPS) X 1/2 = TOTAL DESTINATIONS.

SOURCE: ADAPTED FROM PHOENIX-MARICOPA COUNTY TRIP GENERATION STUDIES OF CAR-ORIENTED USES.

TABLE 3-13

CAR OCCUPANCY BY TRIP PURPOSES - SELECTED URBAN AREAS
INTERNAL TRIPS

CITY (1)	YEAR	WORK	SHOP			PERSONAL BUSINESS	SCHOOL	RECREATION-SOCIAL	
			CONVENIENCE	ALL	GAF(3)			SOC	REC
ALBUQUERQUE,NM	1962	1.2	1.6	---	1.8	1.5	1.8	2.0	1.3
ALLENTOWN-BETHLEHEM EASTON, PA	1966	1.3	1.4	---	1.6	1.4	2.0	2.0	1.7
BATON ROUGE,LA	1965	1.1	1.6	---	1.7	1.4	1.3	2.0	1.8
BILOXI, MS	1968	1.2	1.7	---	1.8	1.6	1.5	2.2	1.8
BOSTON, MA	1964	1.1	1.5	---	1.7	1.4	1.2	1.7	1.6
CHATTANOOGA,TN	1962	1.3	1.5	---	1.6	1.5	2.7	3.0	2.0
CHICAGO, IL	1956	1.2	---	1.5	---	1.6	3.0	2.0	---
CHICAGO, IL	1970	1.2	---	1.5	---	1.4	2.9	1.8	---
CINCINNATI, OH	1965	1.2	---	1.6	---	---	3.6	---2.2---	
COLUMBIA, SC	1965	1.2	1.6	2.1	1.7	1.4	1.5	2.0	1.8
DENVER, CO	1961	1.2	---	2.1	---	1.8	1.2	---2.4---	
DETROIT, MI	1965	1.2	---	1.4	---	1.3	3.5	---2.3---	
DOVER, NH (2)	1967	1.4	---	1.8	---	1.5	1.7	2.6	1.9
EXETER, NH (2)	1968	1.3	---	1.9	---	1.6	2.5	---2.4---	
FRESNO, CA	1971	1.1	---	1.5	---	---	---	---	---
INDIANAPOLIS,IN	1964	1.2	---	1.6	---	1.5	1.7	---1.9---	
JOHNSTOWN, PA	1966	1.3	---	1.7	---	1.4	---	---2.3---	
LAFAYETTE, LA	1965	1.2	1.8	---	1.8	1.5	1.3	2.2	1.9
LEWISTON-AUBURN, ME (2)	1966	1.1	1.5	---	1.6	1.4	1.7	1.3	1.6
LOS ANGELES,CA	1967	1.2	---	1.4	---	---	1.4	2.0	---
MINNEAPOLIS,MN	1956	1.1	---	1.8	---	1.6	2.3	1.3	---
MINNEAPOLIS,MN	1970	1.2	---	1.5	---	1.3	2.3	---2.5---	
MODESTO, CA	1970	1.1	---	1.6	---	---	---	---	---
HONOLULU, HI	1960	1.2	---	2.1	---	1.6	1.3	---2.3---	
OKLAHOMA CITY, OK	1967	1.2	1.4	---	1.6	1.4	2.4	3.2	1.8
ORLANDO, FL	1965	1.2	---	1.8	---	1.6	1.5	---2.0---	
RICHMOND, VA	1964	1.2	1.4	---	1.5	1.4	1.1	1.4	1.5
SAN FRANCISCO, CA	1965	1.2	---	1.4	---	---	2.8	---2.3---	
SEATTLE-TACOMA, WA	1961	1.3	---	1.4	---	---	---	---	---
SOUTHEAST VA	1962	1.4	1.5	---	1.7	1.7	2.4	2.9	2.0
SPRINGFIELD,MA	1965	1.3	1.3	---	1.5	1.4	2.0	2.5	1.6

(1) INTERNAL TRIPS, EXCEPT AS NOTED.
(2) PURPOSE AT DESTINATION.
(3) GAF: GENERAL MERCHANDISE, APPAREL, FURNISHINGS.
(4) INTERNAL AND EXTERNAL SURVEY.

SOURCE: TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-13
(CONTINUED)

CAR OCCUPANCY BY TRIP PURPOSES - SELECTED URBAN AREAS
INTERNAL TRIPS

CITY (1)	YEAR	CHANGE TRAVEL MODE	SERVE PAS-SENGER	MED-ICAL DEN-TAL	EAT MEAL	OTHER	NON-HOME BASED	AVERAGE ALL PURPOSE
ALBUQUERQUE,NM	1962	1.9	2.3	---	---	---	---	1.7
ALLENTOWN-BETHLEHEM EASTON, PA	1966	---	---	---	---	---	---	1.5
BATON ROUGE,LA	1965	1.4	2.2	---	---	---	---	1.6
BILOXI, MS	1968	1.5	2.4	---	---	---	---	1.7
BOSTON, MA	1964	1.3	1.8	---	---	---	1.7	1.5
CHATTANOOGA,TN	1962	1.5	2.1	---	---	---	---	1.7
CHICAGO, IL	1956	---	---	---	---	1.5	---	1.6
CHICAGO, IL	1970	---	---	---	---	1.1	---	1.5
CINCINNATI, OH	1965	---	---	---	---	1.5	1.5	1.5
COLUMBIA, SC	1965	1.6	2.1	---	---	---	---	1.6
DENVER, CO	1961	1.9	---	1.9	1.9	---	---	1.8
DETROIT, MI	1965	---	---	---	---	---	1.5	1.5
DOVER NH . (2)	1967	---	---	---	---	---	---	1.7
EXETER, NH (2)	1968	---	---	1.8	---	---	---	---
FRESNO, CA	1971	---	---	---	---	---	1.6	NA
INDIANAPOLIS,IN	1964	1.9	---	1.6	---	---	---	1.6
JOHNSTOWN, PA	1966	---	---	---	---	---	---	1.7
LAFAYETTE, LA	1965	1.5	---	---	---	---	---	1.7
LEWISTON-AUBURN, ME (2)	1966	1.0	---	---	---	---	1.5	1.5
LOS ANGELES,CA	1967	---	---	---	---	1.7	1.3	1.4
MINNEAPOLIS,MN	1956	---	---	---	---	---	---	1.5
MINNEAPOLIS,MN	1970	---	---	---	---	---	---	1.5
MODESTO, CA	1970	---	---	---	---	---	---	NA
HONOLULU, HI	1960	1.4	---	2.2	---	---	---	1.8
OKLAHOMA CITY, OK	1967	---	---	---	---	---	---	1.5
ORLANDO, FL	1965	---	---	---	---	---	---	1.7
RICHMOND, VA	1964	1.1	---	---	---	---	---	1.3
SAN FRANCISCO, CA	1965	---	---	---	---	---	1.4	1.4
SEATTLE-TACOMA, WA	1961	---	---	---	---	---	1.4	1.5
SOUTHEAST VA	1962	1.3	2.3	---	---	---	---	1.5
SPRINGFIELD,MA	1965	1.2	---	---	---	---	1.3	1.4

(1) INTERNAL TRIPS, EXCEPT AS NOTED.
(2) PURPOSE AT DESTINATION.
(3) GAF: GENERAL MERCHANDISE, APPAREL, FURNISHINGS.

SOURCE: TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-14

AVERAGE DAILY TRUCK TRAVEL IN ELEVEN URBAN AREAS

	TRUCK CLASS		
	LIGHT	MEDIUM-HEAVY	TOTAL
TRUCKS MAKING TRIPS			
NUMBER	72,989	28,691	101,680
PER CENT	71.8	28.2	100.0
DAILY TRIPS			
NUMBER	608,606	289,810	898,416
PER CENT	67.7	32.3	100.0
DAILY TRUCK-MILES			
NUMBER	2,075,660	1,104,742	3,180,402
PER CENT	65.3	34.7	100.0
DAILY MILEAGE			
PER TRUCK	28.4	36.5	
PER TRIP	3.4	3.8	
DAILY TRIPS			
PER TRUCK*	8.3	10.1	

* THESE VALUES ARE FOR TRUCKS MAKING TRIPS ON A TYPICAL WEEKDAY. WHEN RELATED TO ALL TRUCKS REGISTERED IN THE URBAN AREA, THE AVERAGE IS 5.9 TRIPS PER DAY, SINCE A PROPORTION OF THE REGISTERED TRUCKS ARE IDLE ON ANY GIVEN DAY.

NOTE: THE VALUES ARE SUMMATIONS OF TRIPS FOR THE 11 AREAS SHOWN IN SOURCE.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES BY WILBUR SMITH AND ASSOCIATES IN ALBURQUERQUE, NEW MEXICO; BALTIMORE, MARYLAND; BATON ROUGE, LOUISIANA; COLUMBIA, SOUTH CAROLINA; LEWISTON, MAINE; LITTLE ROCK, ARKANSAS; MANCHESTER, NEW HAMPSHIRE; MONROE, LOUISIANA; RICHMOND, VIRGINIA; SIOUX FALLS, SOUTH DAKOTA; AND WINSTON-SALEM, NORTH CAROLINA.

TABLE 3-15

DAILY TRUCK TRAVEL IN ELEVEN URBAN AREAS
BY CATEGORY OF USER AND TRUCK CLASS

USER CATEGORY	PER CENT OF TRUCKS MAKING TRIPS			PER CENT OF DAILY TRIPS			PER CENT OF DAILY VEHICLE-MILES		
	LIGHT	HEAVY	ALL	LIGHT	HEAVY	ALL	LIGHT	HEAVY	ALL
INDUSTRY:									
AGRICULTURE	1.7	2.1	1.9	1.5	1.4	1.5	1.7	1.8	1.8
CONSTRUCTION	20.2	12.3	17.6	11.1	6.9	9.7	20.2	11.7	17.3
MANUFACTURING-PROCESSING	4.4	11.8	6.5	9.4	13.5	10.8	5.8	11.2	7.7
TRANSPORTATION-PUBLIC UTILITIES	6.2	23.3	11.0	12.0	16.5	13.4	7.4	25.2	13.5
WHOLESALE-RETAIL TRADE	20.7	36.4	25.3	33.2	45.6	37.3	26.9	37.0	30.3
SERVICE AND RECREATION	10.2	4.4	8.6	15.9	4.6	12.2	12.4	3.2	9.2
GOVERNMENT (PUBLIC SERVICE)	2.8	6.5	3.9	3.8	9.1	5.5	3.7	7.4	5.0
PERSONAL USE	33.8	3.0	5.2	13.1	2.4	9.6	21.9	2.5	15.2
ALL USERS	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: MOTOR TRUCKS IN THE METROPOLIS, WILBUR SMITH AND ASSOCIATES, 1969.

TABLE 3-16

TRIP PURPOSES OF URBAN TRUCK TRIPS
IN ELEVEN URBAN AREAS

TRIP PURPOSE AT TRIP DESTINATION		PER CENT OF TOTAL DAILY TRIPS
HOME BASE		19.3
PERSONAL USE		9.1
ALL PICKUP AND DELIVERY:		41.1
RETAIL	17.3	
WHOLESALE	16.3	
MERCHANDISE	7.5	
MAIL AND EXPRESS		6.1
CONSTRUCTION		4.9
MAINTENANCE AND REPAIR		8.0
BUSINESS USE		7.2
OTHER		4.3
ALL PURPOSES		100.0

SOURCE: MOTOR TRUCKS IN THE METROPOLIS, WILBUR SMITH AND ASSOCIATES, 1969.

TABLE 3-17

TRUCK TRIP LENGTHS
IN SELECTED URBAN AREAS

URBAN AREA		POPULATION	TRIP LENGTH (MILES) LIGHT	MEDIUM	HEAVY	ALL
ALBUQUERQUE	1958	267,300	3.2	3.0	5.4	3.2
BALTIMORE	1962	1,607,800	3.0	3.0	7.3	3.2
PITTSBURGH	1958	1,472,100	1.6	2.1	4.2	1.8
RICHMOND	1964	417,600	3.0	3.1	7.2	3.1
TRI-STATE (NY)	1963	16,302,000	2.0	3.5	9.6	2.1

NOTE: PITTSBURGH DATA SHOULD BE INCREASED BY 1.4 TO REFLECT OVER-THE-ROAD MILES, NEW YORK DATA BY 1.2.

SOURCE: COMPUTED FROM COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-18

URBAN PERSON TRAVEL IN SELECTED URBAN AREAS (AIRLINE MILES)

STUDY AREA	YEAR	POPULATION	PERSON-MILES (AIRLINE)	PERSON-TRIPS (DEST.)	PERSON-MILES PER CAPITA	AIRLINE TRIP LENGTH (MI)
CHICAGO(1)	1970	7,593,000	95,647,000	18,616,000	12.6	5.1
CHICAGO	1956	5,169,700	49,164,000(2)	10,525,000	9.5	4.9
PHILADELPHIA	1960	4,007,000	27,700,000	7,760,000	6.9	3.6
MINNEAPOLIS	1970	1,874,000	24,668,300	5,095,040	13.2	4.8
WASHINGTON	1955	1,568,500	11,536,000	2,589,000	7.4	4.5
BUFFALO	1962	1,350,000	11,057,000	2,991,000	8.2	3.7

(1) EXPANDED 8 COUNTY AREA.

(2) 65,000,000 OVER-THE-ROAD.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-19

URBAN TRIP LENGTHS BY TRAVEL MODE
IN SELECTED URBAN AREAS
(AIRLINE MILES)

STUDY AREA	YEAR	AUTO DRIVER	AUTO PASSENGER	TAXI	FERRY	BUS-STREET CAR	RAPID TRANSIT	COMMUTER RR.	SCHOOL BUS
BUFFALO	1962	3.6	4.2	1.9	--	3.2	--	--	--
CHICAGO	1956	4.3	4.5	--	--	3.6	7.2	14.6	--
	1970(1)	5.1	5.0	--	--	3.9	7.9	18.5	3.0
DETROIT	1953	3.4	3.4	--	--	4.0	--	--	--
MINNEAPOLIS	1970	5.1	--	--	--	4.3	--	--	--
NEW YORK (TRI-STATE)	1963	4.0	3.6	2.1	4.5	2.5	5.8(3)	17.6	--
PHILADELPHIA	1960	3.4	3.4	--	--	3.0	5.9	10.2	--
SAN DIEGO	1975	7.2		--	--	3.7	7.6(4)	--	--
WASHINGTON	1968(2)	4.9	4.9	--	--	3.6	--	--	--

(1) EXPANDED SURVEY AREA.
(2) NON-WORK.
(3) NYCTA 5.9
PATH 4.9
SIRT 6.2
(4) EXPRESS BUS.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-20

CBD AND OVERALL TRIP LENGTH COMPARISONS (AIRLINE MILES)

AREA	YEAR	TRIP LENGTH MILES		RATIO
		ALL	CBD	
PHILADELPHIA	1960	3.60	5.80	1.61
MINNEAPOLIS	1970	4.87	6.20	1.27
CHICAGO	1970	5.10	8.40	1.65

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-21

WORK VERSUS NON-WORK TRIP LENGTH COMPARISON

ALL MODES-(AIRLINE MILES)	WORK	ALL	RATIO: WORK / ALL
CHICAGO 1970 - ALL TRIPS	7.00	5.10	1.37
MINNEAPOLIS 1970 - ALL TRIPS	6.57	4.87	1.35
PHILADELPHIA 1960 - (ALL TRANSIT)	5.08	4.40	1.15
AUTO DRIVERS - (OVER-THE-ROAD MILES)			
BOSTON	8.0	5.2	1.54
ST. LOUIS	8.2	5.9	1.39
SEATTLE	7.6	5.1	1.49
LOUISVILLE	6.3	4.7	1.34
OKLAHOMA CITY	5.3	3.5	1.51
COLORADO SPRINGS	4.3	3.1	1.39
STOCKTON	4.2	2.9	1.45

SOURCE: CHICAGO, MINNEAPOLIS, PHILADELPHIA - COMPREHENSIVE URBAN AREAS TRANSPORTATION STUDIES; OTHER STUDIES PEAT, MARWICK AND MITCHELL; AN ANALYSIS OF URBAN AREA TRAVEL BY TIME OF DAY.

TABLE 3-22

VEHICLE TRAVEL IN SELECTED URBAN AREAS
(OVER-THE-ROAD MILES)

URBANIZED AREA		YEAR	POPULATION	TRIP LENGTH (MILES)	DAILY VMT/CAPITA	DAILY VMT/CAR
TRI-STATE, NY	(1)	1972	19,100,000	-	9.7	-
	(1)	1963	16,302,000	8.0	8.8	34.2
	(3)	1963	16,302,000	9.9	7.4	-
LOS ANGELES, CA	(1)	1970	10,047,000	NA	14.3	28.1
	(1)	1963	7,579,000	6.0	11.6	28.1
	(3)	1963	7,579,000	8.2	13.5	-
		1967	9,008,400	7.7	13.5	30.9
CHICAGO, IL	(1)	1956	5,170,000	5.9	7.0	26.9
PHILADELPHIA, PA	(1)	1970	4,945,000	-	9.7	-
	(1)	1960	4,007,000	4.9	7.2	26.6
SAN FRANCISCO,CA	(1)	1965	4,400,000	NA	13.7	-
BOSTON, MA	(2)	1963	3,584,000	5.7	8.7	29.2
DETROIT, MI	(1)	1965	4,042,000	5.7	10.4	27.9
		1953	2,968,900	5.5	8.5	29.8
WASHINGTON, DC	(1)	1968	2,714,000	8.3	12.1	31.2
	(3)	1968	2,558,000	6.6	7.1	-
	(1)	1955	1,568,000	4.3	5.5	20.6
ST. LOUIS, MO	(2)	1965	2,175,000	6.3	9.1	-
	(1)	1957	1,276,000	4.7	6.6	22.9
MINNEAPOLIS-ST. PAUL, MN		1970	1,874,400	6.8	12.7	33.3
BALTIMORE, MD	(3)	1962	1,601,000	5.8	NA	-
SAN DIEGO, CA	(1)	1975	1,555,000	7.2	13.4	31.0
CINCINNATI, OH	(1)	1965	1,392,000	5.5	9.2	26.4
BUFFALO, NY	(1)	1962	1,350,000	5.9	8.5	32.8
SEATTLE, WA	(2)	1961	1,350,000	5.5	8.9	24.6
DENVER, CO	(1)	1971	1,116,000	NA	12.2	27.0
		1970	1,000,000	NA	12.3	-

(1) WILBUR SMITH AND ASSOCIATES. SUMMARIES BASED ON COMPREHENSIVE URBAN AREA TRANSPORTATION STUDIES. INCLUDES INTERNAL PLUS EXTERNAL CAR AND TRUCK TRIPS AND OVER-THE-ROAD VMT.

(2) PEAT, MARWICK, MITCHELL & COMPANY SUMMARIES.

(3) J. ZAHAVI SUMMARIES - CAR TRIPS ONLY, EXCEPT WHERE NOTED.

NOTE: NA - NOT AVAILABLE

TABLE 3-22
(CONTINUED)

VEHICLE TRAVEL IN SELECTED URBAN AREAS
(OVER-THE-ROAD MILES)

URBANIZED AREA		YEAR	POPULATION	TRIP LENGTH (MILES)	DAILY VMT/CAPITA	DAILY VMT/CAR
KANSAS CITY, MO	(1)	1959	859,600	4.8	7.6	24.8
LOUISVILLE, KY	(1)	1964	768,900	NA	9.2	27.8
	(2)	1964	752,000	5.6	7.5	22.7
HONOLULU, HI	(1)	1970	750,000	--	11.9	--
SPRINGFIELD, MA	(1)	1965	531,000	5.0	8.9	27.9
BIRMINGHAM, AL	(1)	1965	559,100	5.0	10.1	28.1
TUCSON, AZ	(1)	1973	407,000	NA	12.5	--
		1960	265,600	NA	8.4	23.3
PHOENIX, AZ	(1)	1957	397,400	4.5	9.0	25.8
NASHVILLE, TN	(1)	1959	357,600	4.2	7.5	25.1
ORLANDO, FL	(3)	1965	355,600	4.3	9.1	23.4
PEORIA, IL	(1)	1964	260,800	4.1	9.6	--
BATON ROUGE, LA	(3)	1965	245,100	3.3	7.7	--
SOUTH BEND, IN	(3)	1967	222,100	NA	9.5	23.3
CHARLOTTE, NC	(1)	1958	202,300	3.4	6.9	22.6
EVANSVILLE, IN	(1)	1970	175,500	NA	10.3	23.0
MONROE, LA	(3)	1965	96,500	2.8	7.4	22.6
CHAMPAIGN, IL	(3)	1965	94,200	NA	7.4	NA
FT. SMITH, AR	(3)	1965	80,100	3.1	7.4	21.1

(1) WILBUR SMITH AND ASSOCIATES. SUMMARIES OF ANALYSES OF COMPREHENSIVE URBAN AREA TRANSPORTATION STUDIES. INCLUDES INTERNAL PLUS EXTERNAL CAR AND TRUCK TRIPS AND OVER-THE-ROAD VMT.
(2) PEAT, MARWICK AND MITCHELL SUMMARIES.
(3) J. ZAHAVI SUMMARIES - CAR TRIPS ONLY, EXCEPT WHERE NOTED.

NOTE: POPULATION AS REPORTED BY URBANIZED AREA IN RELATION TO VMT; GENERALLY, BUT NOT ALWAYS TRANSPORTATION STUDY AREA POPULATION.

NA - NOT AVAILABLE

TABLE 3-23

AVERAGE HIGHWAY TRIP LENGTH IN MILES
BY VEHICLE TYPE - SELECTED URBAN AREAS

MODE AND PURPOSE	BOSTON	ST. LOUIS	SEATTLE	LOUIS-VILLE	OKLA-HOMA CITY	COLORADO SPRINGS	FALL RIVER	STOCKTON
AUTO DRIVER	5.2	5.9	5.1	4.7	3.5	3.1	2.0	2.9
HOME BASED WORK	8.0	8.2	7.6	6.3	5.3	4.3	2.5	4.2
HOME BASED NON-WORK	3.9	4.6	4.2	3.7	3.1	2.9	2.0	2.6
NON-HOME BASED	4.1	4.9	4.2	3.8	3.2	2.5	1.7	2.5
TRUCKS	2.8	4.6	4.2	4.0	3.4	3.2	1.4	2.3
TAXIS	1.9	2.4	2.3	3.0	1.9	2.4	2.5	1.7
EXTERNALS								
AUTOS	19.0	21.7	15.0	16.1	25.2	12.5	5.9	10.1
TRUCKS	21.4	23.1	17.3	21.1	24.1	17.5	5.9	10.3
TOTAL VEHICLES	5.7	6.3	5.5	5.6	NA	4.0	2.8	4.7

SOURCE: PEAT, MARWICK, MITCHELL AND COMPANY, AN ANALYSIS OF URBAN AREA TRAVEL BY TIME OF DAY, 1972.

TABLE 3-24

AVERAGE TRIP TIME IN MINUTES
BY TRAVEL MODE AND TRIP PURPOSE

MODE AND PURPOSE	AVERAGE TRIP TIME IN MINUTES								
	BOSTON	ST. LOUIS	SEATTLE	LOUISVILLE	OKLAHOMA CITY	COLORADO SPRINGS	FALL RIVER	STOCKTON	AVG.
TOTAL PERSON	24	24	19	22	25	14	13	14	19
HOME BASED WORK	30	32	26	27	29	16	14	17	24
HOME BASED NON-WORK	22	21	18	20	23	14	13	13	18
NON-HOME BASED	20	20	16	19	24	13	11	13	17
AUTO DRIVER	22	24	18	22	24	13	12	13	18
HOME BASED WORK	28	31	25	25	29	16	13	16	23
HOME BASED NON-WORK	19	19	16	20	23	13	11	12	17
NON-HOME BASED	19	21	16	19	24	12	11	13	17
TRANSIT PERSON	35	44	29	37	31	22	23	25	31
HOME BASED WORK	43	48	36	41	41	21	26	31	36
HOME BASED NON-WORK	31	41	27	34	30	22	24	25	29
NON-HOME BASED	35	37	28	38	32	21	17	22	29

SOURCE: PEAT, MARWICK, MITCHELL AND COMPANY, AN ANALYSIS OF URBAN AREA TRAVEL BY TIME OF DAY, 1972.

TABLE 3-25

AVERAGE DRIVER TRIP TIMES BY PURPOSE
SELECTED URBAN AREAS

CITY & YEAR		WORK	PERSONAL BUSINESS	CONVENIENCE SHOPPING	G.A.F. SHOPPING	SOCIAL	RECREATIONAL
ALLENTOWN-BETHLEHEM-EASTON, PA (LEHIGH VALLEY)	1960	7.8		6.05			6.5
ALTOONA, PA	1967	11.2	-	9.87			
BATON ROUGE, LA	1965	11.3	8.9	5.8	9.5		8.4
BIRMINGHAM, AL (1)	1965	32.1	18.8	16.0			23.5
CINCINNATI, OH	1965	--	17.7	9.9			13.5
DENVER, CO	1971	18.6	-	10.7		-	-
DETROIT, MI	1965	24.5	15.3	13.4			18.0
FT. LAUDERDALE, FL	1958	13.4	-	9.1			12.0
FT. LAUDERDALE, FL	1964	14.3	-	10.0		-	-
HONOLULU, HI	1960	20.5		12.6			16.4
JACKSONVILLE, FL	1968	23.0	16.7	13.3			19.0
JOHNSTOWN, PA	1966	12.8	-	10.2		-	-
LOS ANGELES, CA	1967	17.8	-	5.4		-	-
LOUISVILLE, KY	1964	17.5	-	10.4			13.9
MANCHESTER, NH	1966	9.0	7.2	-	-		7.9
MINNEAPOLIS-ST. PAUL, MN	1970	19.2	14.2	11.4			17.3
OKLAHOMA CITY, OK	1965	12.9	10.2	7.0			9.2
PITTSBURGH, PA (2)	1967	25.1	18.7	19.9			22.6
RICHMOND, VA	1964	12.0	8.7	6.2	9.3	9.0	9.8
SALT LAKE CITY, UT	1964	12.7	10.3	8.0		9.1	-
SAN FRANCISCO, CA	1965	15.8	10.2	9.5			11.5
SPRINGFIELD, MA	1965	9.7	7.8	6.0	9.6	8.1	8.1
ST. LOUIS, MO	1957	14.4	-	-	-	9.7	-
SEATTLE, WA	1961	23.5	-	13.1			20.5
WASHINGTON, DC	1955						
WILKES-BARRE-SCRANTON, PA	1967	18.7	-	13.9			20.3
WILMINGTON, NC	1970	9.5	-	-	-	-	-

(1) MEDIAN.
(2) BY ALL MODES.

NOTE: NA - NOT AVAILABLE.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-25
(CONTINUED)

AVERAGE DRIVER TRIP TIMES BY PURPOSE
SELECTED URBAN AREAS

CITY	YEAR	SCHOOL	OTHER	NON-HOME BASED	TRUCK (DRIVER)	EXTERNAL-INTERNAL	ALL
ALLENTOWN-BETHLEHEM-EASTON, PA (LEHIGH VALLEY)	1966	5.0	-	6.1	-	-	6.5
ALTOONA, PA	1967	-	12.0	8.8	8.1	-	10.2
BATON ROUGE, LA	1965	7.1	7.8	-	-	-	8.3
BIRMINGHAM, AL (1)	1965	-	-	21.3	20.0	40.6	15.4
CINCINNATI, OH	1965	14.2	12.0	12.2	-	-	13.7
DENVER, CO	1971	-	14.1	13.9	13.8	33.0	15.1
DETROIT, MI	1965	14.5	-	16.2	17.2	-	NA
FT. LAUDERDALE, FL	1958	10.0	-	10.9	11.4	-	11.4
FT. LAUDERDALE, FL	1964	-	11.9	11.2	11.5	-	11.8
HONOLULU, HI	1960	12.8	15.8	13.9	12.4	-	NA
JACKSONVILLE, FL	1968	20.1	-	17.0	17.0	-	11.4
JOHNSTOWN, PA	1966	-	11.0	10.5	9.3	13.1	11.5
LOS ANGELES, CA	1967	-	9.7	8.2	-	-	11.0
LOUISVILLE, KY	1964	13.2	11.1	13.0	13.6	22.1	NA
MANCHESTER, NH	1966	8.8	6.6	5.9	-	-	7.2
MINNEAPOLIS-ST. PAUL, MN	1970	27.0	-	-	-	-	16.9
OKLAHOMA CITY, OK	1965	6.6	-	8.0	-	-	9.0
PITTSBURGH, PA (2)	1967	16.0	NA	NA	NA	NA	NA
RICHMOND, VA	1964	8.0	8.5	-	7.2	-	9.2
SALT LAKE CITY, UT	1964	9.6	8.4	8.2	8.8	-	9.4
SAN FRANCISCO, CA	1965	-	9.4	9.1	-	-	-
SPRINGFIELD, MA	1965	6.6	7.6	-	-	-	8.1
ST. LOUIS, MO	1957	6.0	-	-	7.6	-	10.7
SEATTLE, WA	1961	20.5	16.0	16.5	15.0	-	-
WASHINGTON, DC	1955						
WILKES-BARRE-SCRANTON, PA	1967	-	14.3	15.3	13.4	-	16.5
WILMINGTON, NC	1970	-	7.7	7.3	7.2	11.9	8.7

(1) MEDIAN.
(2) BY ALL MODES.

NOTE: NA - NOT AVAILABLE.

SOURCE: COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA.

TABLE 3-26

HOURLY DISTRIBUTION OF PERSON TRIPS IN LARGE URBAN AREAS

HOUR BEGINNING	AUTO DRIVER TRIPS	AUTO PASSENGER TRIPS	AUTO DRIVER AND PASSENGER TRIPS	TRANSIT PASSENGER TRIPS	PERCENT OF TOTAL PERSON TRIPS (1)		
					ALL MODES	AUTO	TRANSIT
1:00 A.M.	0.8	0.9	0.8	0.5	0.5	0.4	0.1
2:00 A.M.	0.4	0.4	0.4	0.3	0.3	0.3	0.0
3:00 A.M.	0.2	0.2	0.2	0.2	0.2	0.2	0.0
4:00 A.M.	0.2	0.1	0.1	0.1	0.1	0.1	0.0
5:00 A.M.	0.6	0.4	0.5	0.5	0.5	0.3	0.2
6:00 A.M.	2.9	7.9	2.5	2.7	2.7	2.0	0.7
7:00 A.M.	7.4	5.5	6.8	7.4	7.4	5.5	1.9
8:00 A.M.	7.3	7.7	7.5	9.1	9.1	6.0	3.1
9:00 A.M.	3.9	2.1	3.3	3.6	3.6	2.7	0.9
10:00 A.M.	3.8	2.2	3.2	3.2	3.2	2.6	0.6
11:00 A.M.	4.1	2.9	3.7	3.5	3.5	2.9	0.6
12:00 NOON	4.3	3.3	4.0	3.8	3.8	3.2	0.6
1:00 P.M.	4.2	3.2	3.9	3.2	3.8	3.2	0.6
2:00 P.M.	4.7	3.6	4.3	4.7	4.3	3.4	0.9
3:00 P.M.	6.4	5.3	6.4	11.3	7.4	5.1	2.3
4:00 P.M.	8.9	8.1	8.6	10.8	9.1	6.9	2.2
5:00 P.M.	9.7	8.7	9.4	11.1	9.8	7.6	2.2
6:00 A.M.	6.7	7.8	7.1	6.3	7.0	5.7	1.3
7:00 P.M.	6.7	10.4	8.0	2.5	6.9	6.4	0.5
8:00 P.M.	5.5	8.8	6.6	1.5	5.6	5.3	0.3
9:00 P.M.	4.1	6.4	4.9	1.6	4.2	3.9	0.3
10:00 P.M.	3.0	4.3	3.5	1.3	3.1	2.8	0.3
11:00 P.M.	2.3	3.1	2.7	1.3	2.4	2.1	0.3
12:00 MID-NIGHT	1.3	1.7	1.6	0.8	1.5	1.4	0.1
TOTAL	100.0	100.0	100.0	100.0	100.00	80.0	20.0

(1) UNWEIGHTED AVERAGES.

SOURCE: COMPREHENSIVE ORIGIN-DESTINATION STUDIES IN CHICAGO, WASHINGTON, DETROIT, PITTSBURGH AND TORONTO.

TABLE 3-27

APPROXIMATE PERCENTAGE OF TRANSIT PASSENGERS OR VEHICULAR VOLUMES TRAVELING DURING PEAK HOURS IN SELECTED CITIES

SYSTEM & CITY(1)	DURING FOUR PEAK HOURS	DURING MAXIMUM PEAK HOUR	PERCENT PEAK HOUR FLOW IN MAJOR DIRECTION (P.M.)	PEAK DIRECTIONAL VOLUME AS PERCENT OF DAILY TOTAL
BUS TRANSIT SYSTEMS				
CHICAGO	40	-	-	12.6
WASHINGTON, DC (3 MAJOR LINES)	53	16	79.0	-
RAIL RAPID TRANSIT SYSTEMS				
BOSTON	44	-	-	
NEW YORK CITY	49	14	86.5	12.1
CHICAGO	58	16	80.5	12.9
TORONTO	51	18	80.5	14.5
CLEVELAND	58	19	84.0	16.0
PHILADELPHIA	58	17	77.0	13.1
COMMUTER SYSTEMS				
CHICAGO	72	25	-	-
WASHINGTON, DC (PENNSYLVANIA RR)	68	23	-	
PHILADELPHIA (PENNSYLVANIA RR)	68	25	84.9	21.2
HIGHWAY SYSTEMS				
DETROIT (LODGE-FORD EXPRESSWAY)	28	7	57.4	4.0
CHICAGO (CONGRESS ST. EXPRESSWAY)	30	8	62.6	5.0
WASHINGTON, DC (MEMORIAL BRIDGE)	44	13	63.7	8.3
BOSTON (ROUTE 128)	29	9	-	-

(1) BASED ON AVAILABLE DATA FOR 1959-1962 PERIOD.

SOURCE: ADAPTED FROM J. MEYER, J. KAIN, M. WOHL, THE URBAN TRANSPORTATION PROBLEM, HARVARD UNIVERSITY PRESS, CAMBRIDGE, MASSACHUSETTS, 1965.

TABLE 3-28

TYPICAL - RESIDENT GOODS VEHICLE CHARACTERISTICS

ITEM	TYPE OF TRUCK LIGHT	MEDIUM	HEAVY	TOTAL
REGISTERED VEHICLES PER 1000 RESIDENTS	17	10	1	28
DAILY TRIPS PER VEHICLE	10.0	10.0	5.0	9.9
DAILY MILES PER VEHICLE	25.0	29.0	30.0	26.6
AVERAGE MILES PER TRIP	2.5	2.9	6.0	2.7

SOURCE: ESTIMATED FROM ORIGIN-DESTINATION STUDIES FOR URBANIZED AREA POPULATION BETWEEN 250,000 AND 500,000.

TABLE 3-29

TRUCK DESTINATIONS PER ACRE
MEDIAN-7

LAND USE	CITIES	RANGE
RESIDENTIAL	1.2	0.1-2.0
MANUFACTURING	2.5	0.4-5.9
TRANSPORTATION	1.7	0.9-4.0
RETAIL-WHOLESALE TRADE	16.0	10.3-35.0
SERVICES, SCHOOLS, ETC.	3.0	2.6-5.2
ALL DEVELOPED LAND	1.3	0.6-3.5

SOURCE: TRANSPORTATION STUDIES IN MONROE, LA; COLUMBIA, SC; LITTLE ROCK, AR; BATON ROUGE, LA; RICHMOND, VA; NASHVILLE, TN; CHICAGO, IL.

TABLE 3-30

CBD TRUCK DESTINATIONS

TYPE OF ESTABLISHMENT	AVERAGE DAILY TRUCK STOPS PER THOUSAND SQ. FT. OF FLOOR SPACE	
	RANGE	TYPICAL VALUE (ROUNDED)
OFFICE	.14-.24	.20
RETAIL		
APPAREL	.18-.67	.45
DEPARTMENT STORE	.14-.37	.25
RESTAURANT	2.7-6.1	3.60
HOTEL	.03-.20	.10
MANUFACTURING	.35-.68	.50
WAREHOUSING	.35-.53	.50

NOTE: A TRUCK "STOP" IS EQUIVALENT TO A VISIT TO A PARTICULAR ESTABLISHMENT.

SOURCE: ADAPTED FROM WILBUR SMITH AND ASSOCIATES, URBAN TRUCK ROAD SYSTEMS AND TRAVEL RESTRICTIONS, VOL. 2 APPENDICES, 1975.

TABLE 3-31

HOURLY VARIATION IN TRUCK TRIPS
ON A TYPICAL BUSINESS DAY

HOUR BEGINNING	PER CENT OF TOTAL		
	LIGHT TRUCKS	MEDIUM-HEAVY TRUCKS	TOTAL - ALL TRUCK TYPES
6:00 A.M.	3.2	3.5	3.3
7:00	6.5	7.0	6.7
8:00	9.1	10.9	9.7
9:00	10.1	11.6	10.6
10:00	10.4	11.4	10.7
11:00	10.1	10.9	10.4
12:00 NOON	7.9	7.5	7.8
1:00 P.M.	9.0	9.5	9.1
2:00	8.5	8.8	8.6
3:00	7.6	8.0	7.8
4:00	8.2	6.4	7.6
5:00	6.1	3.1	5.1
6:00 P.M.	2.7	1.0	2.2
OTHER	0.5	0.4	0.4
TOTAL	100.0	100.0	100.0

SOURCE: PERCENTAGES DERIVED FROM TABLE A-7L, "TRUCK STATISTICS" IN WILBUR SMITH AND ASSOCIATES, MOTOR TRUCKS IN THE METROPOLIS, 1969, P. 185.

TABLE 3-32
PEAKING FACTORS (K-PERCENT OF AVERAGE DAILY TRAFFIC IN THE PEAK HOUR BY STREET TYPE)

FACILITY	STUDY AREA						
	BOSTON	ST. LOUIS	SEATTLE	LOUIS-VILLE	STOCK-TON	FALL RIVER	MANCHESTER
FREEWAYS/ EXPRESSWAYS	K	K	K	K	K	K	K
CBD-NON	-	9.7	10.5	8.4	-	-	-
CCY-RAD	8.4	9.2	10.5	8.4	-	8.3	-
CCY-CIR	-	-	-	8.6	7.5	-	-
SUB-RAD	8.9	9.1	9.1	6.9	7.2	8.6	8.1
SUB-CIR	10.1	10.7	-	-	-	-	-
RUR-RAD	8.3	9.6	8.2	7.2	7.2	-	-
RUR-CIR	9.8	-	-	-	-	-	-
OCR-RAD	9.6	9.2	8.5	-	-	-	-
OCR-CIR	11.0	9.8	-	-	-	-	-
ARTERIALS							
CBD-NON	7.8	10.0	7.9	9.2	9.1	6.8	8.2
CCY-RAD	8.3	9.4	10.1	8.7	8.7	8.2	8.8
CCY-CIR	8.5	9.2	10.0	8.8	8.5	8.9	9.0
CCY-FDR	-	9.6	8.8	9.1	-	-	-
SUB-RAD	9.2	9.0	9.8	8.3	9.0	8.4	9.2
SUB-CIR	8.9	8.8	9.7	9.0	9.4	8.6	8.5
SUB-FDR	9.4	9.4	-	8.6	-	-	-
RUR-RAD	9.2	10.0	9.4	9.0	8.9	-	-
RUR-CIR	9.1	12.0	9.3	10.1	10.3	-	-
RUR-FDR	9.1	10.1	-	-	-	-	-
OCR-RAD	8.3	9.5	9.6	-	-	-	-
OCR-CIR	8.8	9.0	9.2	-	-	-	-
OCR-FDR	9.3	11.1	11.4	-	-	-	-
COLLECTORS							
CBD-ALL	-	10.9	9.1	9.5	-	-	-
CCY-ALL	-	10.8	9.6	9.1	-	-	-
SUB-ALL	12.3	9.8	10.1	9.1	10.7	9.3	-
RUR-ALL	10.8	10.9	9.9	9.2	15.8	-	-
OCR-ALL	8.9	10.2	10.0	-	-	-	-

LEGEND: CBD - CENTRAL BUSINESS DISTRICT
RAD - RADIAL
CCY - CENTRAL CITY
FDR - FEEDER TO EXPRESSWAY
CIR - CIRCUMFERENTIAL
OCR - OTHER SUBCENTER
SUB - SUBURBAN
RUR - RURAL

SOURCE: PEAT, MARWICK, MITCHELL AND COMPANY.

TABLE 3-33
DIRECTIONAL (D) FACTORS
BY STREET TYPE

FACILITY	STUDY AREA						
	BOSTON	ST. LOUIS	SEATTLE	LOUISVILLE	STOCKTON	FALL RIVER	MANCHESTER
FREEWAYS/ EXPRESSWAYS	D	D	D	D	D	D	D
CBD-NON	-	69.9	63.8	55.2	-	-	-
CCY-RAD	50.7	64.3	75.4	56.8	-	60.1	-
CCY-CIR	-	-	-	59.2	58.2	-	-
SUB-RAD	55.4	60.6	64.6	55.5	59.1	50.5	59.0
SUB-CIR	59.0	59.1	-	-	-	-	-
RUR-RAD	55.1	66.8	55.5	58.4	52.3	-	
RUR-CIR	72.5	-	-	-	-	-	-
OCR-RAD	52.4	68.6	52.7	-	-	-	-
OCR-CIR	57.7	64.0	-	-	-	-	-
ARTERIALS							
CBD-NON	62.4	62.9	53.8	59.4	66.5	-	-
CCY-RAD	53.6	66.1	68.1	65.1	59.8	56.5	-
CCY-CIR	51.6	63.9	66.7	56.9	56.3	55.6	-
CCY-FDR	-	63.6	55.2	64.6	-	-	-
SUB-RAD	56.7	64.6	66.8	61.1	67.2	56.3	-
SUB-CIR	57.6	58.9	63.8	62.8	65.4	52.7	-
SUB-FDR	-	62.7	-	60.2	-	-	-
RUR-RAD	-	67.6	52.1	61.5	61.9	-	-
RUR-CIR	-	68.9	52.1	-	59.0	-	-
RUR-FDR	59.3	61.7	-	-	-	-	-
OCR-RAD	59.5	58.1	64.4	-	-	-	-
OCR-CIR	52.1	62.9	55.9	-	-	-	-
OCR-FDR	53.4	60.2	57.8	-	-	-	-
COLLECTORS							
CBD-ALL	-	65.0	69.0	59.1	-	-	-
CCY-ALL	-	67.8	57.1	60.9	-	-	-
SUB-ALL	55.9	60.8	62.7	65.5	60.6	61.2	-
RUR-ALL	-	71.6	50.7	55.8	15.8	-	-
OCR-ALL	-	62.2	65.6	-	-	-	-

LEGEND: CBD - CENTRAL BUSINESS DISTRICT
RAD - RADIAL
CCY - CENTRAL CITY
FDR - FEEDER TO EXPRESSWAY
CIR - CIRCUMFERENTIAL
OCR - OTHER SUBCENTER
SUB - SUBURBAN
RUR - RURAL

SOURCE: PEAT, MARWICK, MITCHELL AND COMPANY.

TABLE 3-34

ILLUSTRATIVE DEMAND INDICES FOR URBANIZED AREA

ITEM	URBANIZED AREA POPULATION 100,000	1,000,000	RATIO
DAILY PERSON TRIPS (ALL MODES)	270,000	2,500,000	9.2
DAILY PERSON MILES OF TRAVEL	1,100,000	13,000,000	11.8
VEHICLE MILES OF TRAVEL (1)	820,000	9,400,000	11.5
CBD AREA (SQUARE MILES)	0.30	0.72	2.4
CBD EMPLOYMENT	10,000	60,000	6.0
CBD FLOOR SPACE (MILLIONS OF SQUARE FEET)	4.50	25.00	5.6
CBD CORDON ENTRANTS 12 HOURS (PERSONS)	100,000	270,000	2.7
CBD CORDON CROSSINGS - PERSONS OUTBOUND IN PEAK HOUR	20,000	54,000	2.7
CBD MAXIMUM PERSON ACCUMULATION	25,000	75,000	3.0
CBD PERSON DESTINATIONS	35,000	135,000	3.9
PERCENT TO WORK	30-35	50-55	1.7
CBD PARKING SPACES (TOTAL)	4,200	18,000	4.3
OFF STREET PARKING SPACES	2,500	16,000	6.4
ON-STREET PARKING SPACES	1,700	2,000	1.2
DAILY PARKERS	14,000	38,000	2.7

SOURCE: ESTIMATED BASED ON COMPREHENSIVE ORIGIN-DESTINATION STUDIES.

TABLE 3-35

ILLUSTRATIVE PEAK-HOUR TRAVEL DEMAND IN HEAVILY TRAVELED CORRIDORS ON APPROACH TO A STRONG CBD (SYMMETRICAL CITY)

ITEM	URBAN AREA POPULATION 250,000	500,000	1,000,000	2,000,000
CBD DESTINATIONS/DAY (PERSONS)	40,000	80,000	135,000	225,000
PM PEAK-HOUR OUTBOUND ACROSS CORDON (PERSONS)	16,000	32,000	54,000	100,000
HEAVIEST CORRIDOR 25-35% (PERSONS)	4,000-5,600	8,000-11,000	13,500-19,000	25,000-33,000
PERCENT TRANSIT	10-15	25-35	40-50	50-65
NUMBER OF TRANSIT PASSENGERS	400-800	2,000-3,300	5,400-8,500	12,500-21,300
PERCENT EXPRESS BUS OR RAIL TRANSIT OF TOTAL	10-15	15-20	25-35	35-50-65 (1)
EXPRESS TRANSIT	40-120	300-660	1,350-2,900	4,400-10,600-13,800
EQUIVALENT EXPRESS BUSES 50 PASS/BUS	1-3	6-12	27-58	88-212 (2)
EQUIVALENT RAIL CARS 100 PASS/CAR	-(3)	-(3)	14-29	44-106-138

(1) FOR EXISTING CITIES WITH EXTENSIVE RAIL TRANSIT, THIS PERCENTAGE RANGES FROM ABOUT 50-80 PERCENT (NEW YORK EXCLUDED). A 65% FACTOR THEREFORE APPEARS REASONABLE IN ESTIMATING RAIL SYSTEM POTENTIALS IN LARGE CITIES.
(2) OUTSIDE DOMAIN OF BUSES.
(3) OUTSIDE DOMAIN OF RAIL.

NOTE: FOR CITY WITH MAJOR BARRIERS OF IMBALANCES IN TRIP ORIENTATION, MULTIPLY VALUES BY $\frac{360}{X}$ WHERE X = DEGREES IN CITY. THUS, FOR HALF A CITY, THE EXPRESS BUS TRANSIT POTENTIALS WOULD BE: 6, 24, 116, AND 424 RESPECTIVELY.

SOURCE: ADAPTED FROM TABLE 1, WYNN AND LEVINSON, "SOME CONSIDERATIONS IN APPRAISING BUS TRANSIT POTENTIALS", HIGHWAY RESEARCH BOARD RECORD 197 PASSENGER TRANSPORTATION, 1967. TABLE A-9, TRANSPORTATION AND PARKING FOR TOMORROW'S CITIES, WILBUR SMITH AND ASSOCIATES, 1966, AND TABLE 11, URBAN TRANSPORTATION CONCEPTS CENTER CITY TRANSPORTATION PROJECT, WILBUR SMITH AND ASSOCIATES, 1975.

CHAPTER 4

CBD TRAVEL

TABLE 4-1

CENTRAL BUSINESS DISTRICT DATA AS REPORTED
IN 1970 JOURNEY TO WORK CENSUS

SMSA	REGIONAL POPULATION (THOUSANDS)	CBD WORKERS (THOUSANDS)	CBD AREA SQ. MILES
ATLANTA	1,390	62	1.20
BALTIMORE	2,071	50	0.53
BOSTON	2,754	91	1.00
BUFFALO	1,349	41	0.80
CHICAGO	6,978	252	1.55
CINCINNATI	1,385	53	0.80
CLEVELAND	2,064	74	1.10
COLUMBUS	916	45	0.90
DALLAS-FT. WORTH	2,318	74	1.40
DAYTON	850	28	0.80
DENVER	1,230	45	0.90
DETROIT	4,204	87	1.10
HOUSTON	1,985	105	(1)
INDIANAPOLIS	1,111	60	(1)
KANSAS CITY	1,256	37	0.80
LOS ANGELES	7,041	143	2.80
LOUISVILLE	826	49	(1)
MIAMI	1,268	26	0.40
MILWAUKEE	1,404	49	1.00
MINNEAPOLIS-ST. PAUL	1,814	94	1.50
NEW ORLEANS	1,046	74	1.20
NEW YORK	11,572	921	4.00
PHILADELPHIA	4,822	128	2.54
PHOENIX	968	22	1.00
PITTSBURGH	2,401	76	0.55
PORTLAND (OR)	1,007	33	0.40
PROVIDENCE	914	27	0.50
ST. LOUIS	2,363	34	0.35(2)
SAN ANTONIO	864	33	1.00
SAN DIEGO	1,358	23	0.33
SAN FRANCISCO-OAKLAND	3,108	183	1.13
SAN JOSE	1,067	13	1.40
SEATTLE	1,425	39	0.50
TAMPA-ST. PETERSBURG	1,013	23	(1)
WASHINGTON (DC)	2,862	147	1.40

(1) REPORTED VALUES OVERSTATE AREA.

(2) REPORTED VALUES PROBABLY UNDERSTATE AREA.

SOURCE: BRONITSKY, L., COSTELLO, M., HAALAND, C., SCHIFF, S., URBAN DATA BOOK REPORT DOT-TSC-OST 75-45 TRANSPORTATION SYSTEMS CENTER, CAMBRIDGE, MASS., NOVEMBER, 1975.

TABLE 4-2

CENTRAL BUSINESS DISTRICT DATA AS REPORTED
IN VARIOUS COMPREHENSIVE URBAN TRANSPORTATION STUDIES

CITY	YEAR	REGIONAL POPULATION	WORKERS IN STUDY AREA	WORKERS IN CBD	PERCENT OF TOTAL IN CBD
ALBUQUERQUE, NM	1962	284,600	100,000	9,000	9.0
ATLANTA, GA	1961	700,100	254,200	75,000	29.4
AUSTIN, TX	1962	187,100	91,100	21,700	23.8
BALTIMORE, MD	1962	1,607,800	602,100	78,000	12.9
BOSTON, MA	1963	3,584,400	1,296,700	246,300	19.0
BUFFALO, NY	1962	1,350,000	492,000	48,000	9.8
CHATTANOOGA, TN	1960	241,800	97,000	16,500	17.0
CHICAGO, IL	1956	5,159,700	2,548,800	300,000	11.8
CLEVELAND, OH	1963	2,140,000	747,700	117,000	15.7
COLUMBUS, OH	1964	734,200	248,600	27,200	11.0
DALLAS, TX	1964	1,822,800	678,400	133,000	19.7
DENVER, CO	1959	806,100	308,200	50,000	16.2
DETROIT, MI	1953	2,968,900	1,187,000	114,000	9.6
EL PASO, TX	1958	250,000(1)	91,300	13,700	15.0
ERIE, PA	1962	177,400	65,000	10,400	16.0
FORT WAYNE, IN	1966	232,700	115,700	24,700	21.4
GREAT FALLS, MT	1961	57,600	25,400	6,600	38.5
HARTFORD, CT	1960	600,000(1)	258,900	28,500	11.0
HONOLULU, HI	1960	480,100	200,300	20,000	10.0
HOUSTON, TX	1960	1,159,500	409,900	119,000	29.3
INDIANAPOLIS, IN	1964	762,900	320,000	85,000	26.6
JACKSONVILLE, FL	1960	355,100	128,600	22,500	17.5
KANSAS CITY, MO	1957	857,600	340,100	65,000	18.2
KNOXVILLE, TN	1962	241,800	89,100	18,700	21.0
LEXINGTON, KY	1961	111,900	40,300	9,700	24.1
LOS ANGELES, CA	1960/1	7,592,900	3,047,000	130,000	4.3
	1966			176,000	5.8
LOUISVILLE, KY	1964	768,900	278,000	57,500	20.4
MADISON, WI	1962	157,800	67,300	12,100	18.0
MIAMI, FL	1964	1,187,000	429,400	28,500	6.6
MILWAUKEE, WI	1963	1,644,000	634,900	90,000	14.3
ST PAUL, MN	1958	1,376,900	44,700		12.1
NASHVILLE, TN	1959	357,600	142,000	33,800	23.8
NEW YORK CITY, NY	1963	16,302,000	6,220,000	1,777,000(3)	29.0
NEW ORLEANS, LA	1960	825,500	314,700	60,000	28.6
PHILADELPHIA, PA	1960	4,007,000	1,437,300	225,000	15.7
PHOENIX, AZ	1956/57	397,400	--	--	--
PITTSBURG, PA	1958	1,472,100	554,000	83,600	15.1
PORTLAND, ME	1963	111,700	55,100	9,900	18.0
PORTLAND, OR	1970	874,000	400,000	54,000	13.5
PROVIDENCE, RI	1960/61	658,600	215,500	39,900	18.5
ST. JOSEPH, MO	1962	81,200	30,800	10,200	33.0
ST. LOUIS, MO	1957	1,275,500	490,500	118,800	24.2

SAN DIEGO, CA	1966	1,180,000	350,300	NA	--
SAN FRANCISCO, CA	1965	4,400,300	1,664,000	282,000	17.0
SAN JOSE, CA	1976	NA	366,000(1)	111,000	30.0
SAN JUAN, PR	1964	758,800	216,000	NA	--
SEATTLE, WA	1961	1,347,000	463,400	78,800	16.8
SIOUX FALLS, SD	1963	66,600	28,900	7,800	27.0
SPRINGFIELD, MA	1965	531,000	191,700	20,000	9.6
TAMPA-ST. PETERS-BURG, FL	1965	395,700	119,200	17,800	15.0
TOPEKA, KS	1958	119,600	45,600	16,900	37.0
TUCSON, AZ	1960	244,500	67,400	9,400	14.0
WASHINGTON, DC	1955	1,568,500	736,000	212,000(2)	28.6
WATERBURY, CT	1962	141,600	67,400	11,500	16.9

(1) ESTIMATE.
(2) CBD.
(3) MIDTOWN.

SOURCE: COMPREHENSIVE URBAN TRANSPORTATION STUDIES.

TABLE 4-3

SELECTED CHARACTERISTICS OF CENTRAL BUSINESS DISTRICTS

URBANIZED AREA	1970 POPULATION URBANIZED AREA (MILLIONS)	1970 POPULATION CENTRAL CITY (MILLIONS)	1970 CENTRAL CITY POP. DENSITY (PERSONS /SQ.MI.)	CBD AREA (SQ. MI.)	YEARS OF O-D SURVEY
NEW YORK-NE NEW JERSEY	16.207	7.895	26,343	9.0(1)	1963
				2.0(2)	1963
				1.0(2)	1963
LOS ANGELES-LONG BEACH, CA	8.351	2.816	6,073	0.6(3)	1960
				2.0(4)	1966
CHICAGO-NE INDIANA	6.715	3.367	15,126	1.1	1956
PHILADELPHIA-NEW JERSEY	4.021	1.949	15,164	2.2	1960
DETROIT, MI	3.971	1.511	10,953	1.1	1953
SAN FRANCISCO-OAKLAND, CA	2.988	0.716	15,764	2.2	1965
BOSTON, MA	2.653	0.641	13,936	1.4	1963
WASHINGTON, DC - MARYLAND-VIRGINIA	2.481	0.757	12,321	4.5(5)	1955
				1.7(6)	1955
CLEVELAND, OH	1.960	0.751	9,893	1.0	1963
ST.LOUIS, MO - IL	1.883	0.622	10,167	0.8	1957
PITTSBURGH, PA	1.846	0.520	9,422	0.5	1958
MINNEAPOLIS-ST. PAUL, MN	1.704	0.434	8,135	0.9	1958
				0.9	1970
HOUSTON, TX	1.678	1.231	3,102	0.9	1953
BALTIMORE, MD	1.580	0.906	11,568	0.8	1962
DALLAS, TX	1.339	0.844	3,179	0.54(3)	1964
				1.50(3)	1964
MILWAUKEE, WI	1.252	0.717	7,548	0.9	1963
SEATTLE-EVERETT, WA	1.238	0.531	6,350	0.6	1961
MIAMI, FL	1.220	0.335	9,763	0.9	1965
SAN DIEGO, CA	1.198	0.694	3,261	2.2	1966
ATLANTA, GA	1.173	0.497	3,779	0.6	1961
CINCINNATI, OH - KY	1.111	0.452	5,794	0.5	1965
KANSAS CITY, MO-KS	1.111	0.502	2,101	0.9	1957
BUFFALO, NY	1.087	0.463	11,205	0.9	1962
DENVER, CO	1.047	0.515	5,406	0.5	1959
SAN JOSE, CA	1.025	0.444	3,817	--	--
NEW ORLEANS, LA	0.962	0.592	6,846	1.5	1960
PHOENIX, AZ	0.863	0.582	2,346	0.7	1957
PORTLAND, OR	0.825	0.383	4,294	1.2	1970
INDIANAPOLIS, IN	0.820	0.743	2,113	--	1964
PROVIDENCE, RI	0.795	0.179	9,482	--	1960
NASHVILLE-DAVIDSON, TN	0.448	0.436	1,305	0.6	1959

(1) MANHATTAN - SOUTH OF 59TH STREET.
(3) MIDTOWN
(3) MIDTOWN CORE
(4) CORDON AREA
(5) ZERO SECTOR
(6) CBD

SOURCE: COMPILED FROM COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA, AND FROM INFORMATION FURNISHED BY VARIOUS CITIES.

TABLE 4-3

SELECTED CHARACTERISTICS OF CENTRAL BUSINESS DISTRICTS
(CONTINUED)

URBANIZED AREA	YEARS O-D SURVEY	CBD EMPLOY-MENT (000'S)	CBD FLOOR SPACE (MIL. SQ.FT.)	NUMBER (000'S)	% BY AUTO	% BY TRANSIT	CBD DESTINATIONS /SQ. MI. ALL MODES	CBD DESTINATIONS /SQ. MI. AUTO ONLY
NEW YORK-NE NEW JERSEY	1963	1,777	800	1,300	5	95	1,300	66
	1963	1,000	241	--	--	--	--	--
	1963	500	--	--	--	--	--	--
LOS ANGELES-LONG BEACH, CA .	1960	130	42	158	45	55	250	114
	1966	176(1)	76	--	--	--	--	--
CHICAGO-NE IN	1956	300	92	466	29	71	439	128
PHILADELPHIA-NEW JERSEY	1960	225	124	389	41	59	177	73
DETROIT, MI	1953	114	50	253	56	44	234	132
	1974	--	--	62	65	35	--	--
SAN FRANCISCO-OAKLAND, CA	1965	282	88	423	63	37	192	71
	1970	304	--	--	--	--	--	--
BOSTON, MA	1963	246	--	400	50	50	290	145
	1972	263	96	--	--	--	--	--
WASHINGTON, DC - MD - VA	1955	315	--	442	57	43	98	43
	1955	212	90	266	55	45	156	86
CLEVELAND, OH	1963	117	47	123	59	41	123	73
ST.LOUIS, MO - IL	1957	119	39	125	53	47	178	95
PITTSBURGH, PA	1958	84	32	154	49	51	308	151
	1967-69	100	--	151	55	45	302	166
MINNEAPOLIS-ST. PAUL, MN	1956	90	--	188	73	27	209	153
	1970	--	--	166	80	20	184	147
HOUSTON, TX	1953	--	--	141	69	31	157	109
	1960	120	61 ('76)	113	80	20	125	100
BALTIMORE, MD	1962	85	33	130	54	46	162	88
DALLAS, TX	1964	--	--	--	--	--	--	--
	1964	135	31	164	86	14	109	94
	1970	116	61 ('76)	--	--	--	--	--
MILWAUKEE, WI	1963	--	31	140	66	34	155	102
	1972	91	--	134	78	22	149	116
SEATTLE-EVERETT, WA	1961	60	27	126	71	29	210	167
	1970	60	37	145	--	--	24	--
MIAMI, FL	1965	28	12	49	67	33	54	36
SAN DIEGO, CA	1966	--	23	130	88	12	59	52
ATLANTA, GA	1961	75	30	94	72	28	156	112
CINCINNATI, OH - KY	1965	--	35	113	71	29	220	156

KANSAS CITY, MO-KS	1957	65	30 ('75)	107	70	30	118	82
	1971	58	31	--	--	--	--	--
BUFFALO, NY	1962	48	28	104	67	33	115	77
DENVER, CO	1959	50	24	105	80	20	210	167
SAN JOSE, CA	--	11	7	--	--	--	--	--
NEW ORLEANS, LA	1960	60	--	129	--	--	86	--
PHOENIX, AZ	1957	21	--	65	89	11	93	83
PORTLAND, OR	1970	54	--	133	81	19	110	90
INDIANAPOLIS, IN	1964	85	30	150	87	13	--	--
PROVIDENCE, RI	1960	40	11	--	--	--	--	--
NASHVILLE-DAVIDSON, TN	1959	34	--	64	79	21	110	87

(1) 1966

SOURCE: COMPILED FROM COMPREHENSIVE TRANSPORTATION STUDIES IN EACH URBAN AREA, AND FROM INFORMATION FURNISHED BY VARIOUS CITIES.

TABLE 4-4

CENTRAL BUSINESS DISTRICT CORDON COUNTS

URBANIZED AREA	1970 URBANIZED AREA POPULATION	YEAR OF COUNT	PEAK-HOUR ONE-WAY PERSONS (000'S)
NEW YORK, NY	16,206,841	1974	738
		1971	805
LOS ANGELES, CA	8,351,266	1970	99
		1974	93
CHICAGO, IL - IN	6,714,578	1971	210
		1974	200
PHILADELPHIA, PA - NJ	4,021,066	1955	177
DETROIT, MI	3,970,584	1956	66
		1974	39
SAN FRANCISCO-OAKLAND, CA	2,987,850	1965	129
BOSTON, MA	2,652,575	1974	131
		1972	143
WASHINGTON, DC	2,481,489	1961-62	138
		1968	159
CLEVELAND, OH	1,959,880	1970	50(1)
ST. LOUIS, MO	1,882,944	1957	62
PITTSBURGH, PA	1,846,042	1963	56
MINNEAPOLIS, MN	1,704,423	1974	-
		1965	57
HOUSTON, TX	1,677,853	1971	55(4)
			68(5)
BALTIMORE, MD	1,579,781	1955	67
DALLAS, TX	1,338,684	1964	62(6)
		1971	50(7)
MILWAUKEE, WI	1,252,457	1974(3)	33
ATLANTA, GA (2)	1,172,778	1962(APPROX)	31
CINCINATTI, OH	1,110,514	1962(APPROX)	35
DENVER, CO	1,047,311	1962	31
NEW ORLEANS, LA	961,728	1966	36

(1) ESTIMATED.
(2) 1976 - ATLANTA - 21,100 VEHICLES IN A.M., OR ABOUT 30,000 PERSONS IN CARS.
(3) ESTIMATED, BASED ON 12 HOUR CORDON COUNT AND PEAK-HOUR VEHICLE FLOW.
(4) CENTRAL TRAFFIC DISTRICT - 0.63 SQUARE MILE.
(5) CENTRAL BUSINESS DISTRICT - 1.53 SQUARE MILES.
(6) LARGER CBD AREA.
(7) CORDON AROUND CORE AREA.

SOURCE: CORDON COUNTS IN INDICATED CITIES.

TABLE 4-4
(CONTINUED)

CENTRAL BUSINESS DISTRICT CORDON COUNTS

URBANIZED AREA	YEAR OF COUNT	PEAK-HOUR PERCENT		PEAK ACCUMULATION		
		AUTO	TRANSIT	PERSONS	PERCENT AUTO	PERCENT TRANSIT
				(000'S)		
NEW YORK, NY	1974	10	90	NA	NA	NA
	1971	8	92	2,056(1)	NA	NA
LOS ANGELES, CA	1970	69	31	148	67	33
	1974	63	37	152	62	38
CHICAGO, IL - IN	1971	19	81	283(2)	14	86(2)
	1974	18	82	295	17	83
PHILADELPHIA, PA - NJ	1955	29	71	210	23	77
DETROIT, MI	1956	49	51	NA	NA	NA
	1974	65	35	62	65	35
SAN FRANCISCO-OAKLAND, CA	1965	56	44	165	NA	NA
BOSTON, MA	1974	51	49	192	40	60
	1972	50	50	195	38	62
WASHINGTON, DC	1961-62	65	35	NA	NA	NA
	1968	71	29	NA	NA	NA
CLEVELAND, OH	1970	56	44	92	41	59
ST. LOUIS, MO	1957	58	42	89	50	50
PITTSBURGH, PA	1963	54	46	94	50(1)	50(1)
MINNEAPOLIS, MN	1974	-	-	55	56	44
HOUSTON, TX	1965	80	20	60	80	20
	1971	86(5)	14	56	86	14
		86(6)	14	67	86	14
BALTIMORE, MD	1955	56	44	119	66	34
DALLAS, TX	1964	81	19	86	84	16(7)
	1971	72	28	64	72	28(8)
MILWAUKEE, WI	1974(4)	75	25	-	-	-
ATLANTA, GA(3) (APP.)	1962	55	45	56	NA	NA
CINCINATTI, OH (APP.)	1962	70	30	NA	NA	NA
DENVER, CO	1962	76	24	38	57	43
NEW ORLEANS, LA	1966	56	44	55	54	46

(1) ESTIMATED.
(2) CATS ESTIMATES 325,000 FOR 1970.
(3) 1975 - ATLANTA - 21,100 VEHICLES IN A.M., OR ABOUT 30,000 PERSONS IN CARS.
(4) ESTIMATED, BASED ON 12 HOUR CORDON COUNT AND PEAK-HOUR VEHICLE FLOW.
(5) CENTRAL TRAFFIC DISTRICT - 0.63 SQUARE MILE.
(6) CENTRAL BUSINESS DISTRICT - 1.53 SQUARE MILES.
(7) LARGER CBD AREA.
(8) CORDON AROUND CORE AREA.

SOURCE: CORDON COUNTS IN INDICATED CITIES.

TABLE 4-5

CBD VEHICLE CORDON COUNTS
SELECTED CITIES

CITY	1970 URBANIZED AREA POPULATION	YEAR OF CORDON COUNT	COUNT PERIOD	CORDON AREA (SQ.MI.)	BOTH DIRECTIONS TOTAL VEHICLE COUNT	BOTH DIRECTIONS TRUCK COUNT	BOTH DIRECTIONS BUS COUNT
BOSTON,MA (1)	2,652,575	1972	18-HR 6:00 AM-12:00 MID	2.4	844,141	79,187	5,586
CHARLOTTE,NC	279,530	1971	12-HR 7:00 AM-7:00 PM	1.5	158,984	14,686	2,404 (4)
CHICAGO,IL (1)	6,714,578	1971	12 HR 7:00 AM-7:00 PM	1.6	403,431	34,743	14,069
CLEVELAND,OH (1)	1,959,880	1970	12 HR 7:00 AM-7:00 PM	1.0	233,575	17,041	(2)
DALLAS,TX	1,338,684	1971	12 HR 6:30 AM-6:30 PM	1.3	276,338	24,678	4,269
DETROIT,MI	3,970,584	1974	12 HR 7:00 AM-7:00 PM	1.1	260,196	22,924	4,973
HOUSTON,TX	1,667,863	1965	12 HR 7:00 AM-7:00 PM	0.8	363,927	21,373	(2)
LOS ANGELES,CA	8,351,266	1970	16 HR 6:00 AM-10:00 PM	1.1	622,765	56,805	8,967
PITTSBURGH,PA	1,846,042	1963	11 HR 7:00 AM-6:00 PM	0.5	210,197	27,422	6,858 (3)
TORONTO,ON (1)	2,628,043	1969	17 HR 6:30 AM-11:30 PM	0.4	308,908	36,878	7,071 (3)

(1) CITIES WITH RAIL RAPID TRANSIT AND/OR COMMUTER RAIL SERVICE. CORDON COUNTS DO NOT INCLUDE THESE VOLUMES.
(2) BUS COUNTS INCLUDED IN TRUCK COUNTS.
(3) BUS COUNTS INCLUDE SURFACE STREET CARS.
(4) BUS COUNT BELIEVED INACCURATE.

SOURCE: CORDON COUNTS IN EACH CITY

TABLE 4-6

CBD TRIP PURPOSES

CITY	YEAR	STUDY AREA POPULATION (000)	PERCENTAGE DISTRIBUTION				
			WORK	BUSINESS	SHOPPING	SOCIAL/ RECREATIONAL	OTHER
ATLANTA	1961	700	51	13	14	6	16
BOSTON	1972	2753(1)	55		-45-		
CHATTANOOGA	1960	242	43	13	15	10	19
DALLAS	1964	1821	55	15	5	5	20
DENVER	1962	806	47	12	12	12	17
MILWAUKEE	1963	1644	51	18	12	11	8
	1972	1800	50	22	9	9	10
MINNEAPOLIS	1958	1377	53	19	20	7	--
	1974	1874	47	21	10	10	12
PHILADELPHIA	1960	4007	59	13	11	10	7
PITTSBURGH	1958	1472	53	13	20	5	4
	1967	NA	56		-42-		
TUCSON	1960	230	31	16	22	11	20

(1) 1970 SMSA.

SOURCE: ORIGIN-DESTINATION STUDIES IN EACH URBAN AREA.

TABLE 4-7

COMPARISON OF DOWNTOWN PARKING CHARACTERISTICS
SELECTED URBAN AREAS

	NEW ORLEANS	BUFFALO	ATLANTA	BOSTON	BALTIMORE	SAN FRANCISCO	PHILADELPHIA	LOS ANGELES
POPULATION (000'S) URBANIZED AREA	845	1,034	1,259	1,754	2,071	3,000	3,635	7,033
STUDY YEAR	1960	1962	1966	1972	1969	1966	1957	1967
STUDY BLOCKS	113	48	174	340	490	200	352	237
TOTAL SPACES (000'S)	13,634	6,609	36,292	39,230	38,636	61,000	39,024	81,452
ACCUMULATION/ PEAK	12,167	4,913	30,228	36,120	32,129	52,000	22,640	60,500
ACCUMULATION/ PER CENT (1)	89.2	74.3	83.3	90.9	83.2	84.2	58.0	74.3
AVERAGE WALKING DISTANCE (FEET)	478	490	658	895	670	478	NA	399
AVERAGE DURATION	2H.36M.	2H.6M.	3H.9M.	4H.40M.	3H.37M.	2H.39M.	3H.40M.	3H.10M
TRIP PURPOSE:								
% WORK	32	22	34	36	39	35	30	47
% SHOPPING	11	21	24	15	11	9	12	11
% OTHER	57	57	42	49	50	56	58	42

(1) PER CENT OF TOTAL SPACES.

SOURCE: PARKING STUDIES IN EACH URBAN AREA.

TABLE 4-8

DAILY PEAKING PATTERNS OF WALKWAYS IN FIVE SELECTED AREAS
PERCENTAGE OF 12-HOUR TWO-WAY FLOW DURING EACH 15 MINUTES

TIME	GRAND CENTRAL ESCALATORS (1 LOCATION)	GRAND CENTRAL AREA (4 SIDEWALK LOCATIONS)	48TH ST. 2ND-7TH AVENUES (12 SIDEWALK LOCATIONS)	FIFTH AVE. 44TH-47TH STREETS (4 SIDEWALK LOCATIONS)	42ND ST. NEAR TIMES SQUARE (2 SIDEWALK LOCATIONS)
7:30-7:45	0.6	0.6	0.8	0.3	0.5
7:45- 8:00	1.4	0.9	0.8	0.3	0.7
8:00- 8:15	2.3	1.3	1.1	0.5	1.0
8:15- 8:30	3.3	1.8	1.8	0.8	1.3
8:30- 8:45	4.3	2.5	2.9	1.3	1.6
8:45- 9:00	4.3	3.2	3.0	1.8	1.8
9:00- 9:15	3.9	2.7	2.9	1.5	1.9
9:15- 9:30	3.4	1.7	1.8	1.1	1.4
9:30- 9:45	1.4	1.4	1.4	1.2	1.3
9:45-10:00	1.3	1.4	1.4	1.0	1.4
10:00-10:15	1.0	1.2	0.8	1.2	1.4
10:15-10:30	1.2	1.4	1.0	1.4	1.5
10:30-10:45	1.1	1.3	0.8	1.7	1.6
10:45-11:00	1.0	1.5	1.0	1.7	1.5
11:00-11:15	0.9	1.5	0.8	1.6	1.7
11:15-11:30	1.1	1.7	1.0	2.0	1.3
11:30-11:45	1.3	2.0	1.5	2.2	1.9
11:45-12:00	1.6	2.2	2.0	2.6	2.0
12:00-12:15	2.4	3.3	2.4	3.4	2.5
12:15-12:30	2.2	3.5	3.4	3.7	2.9
12:30-12:45	2.1	4.0	4.0	4.6	2.8
12:45- 1:00	2.5	4.0	3.7	4.2	3.1
1:00- 1:15	2.6	4.0	3.5	4.2	3.4
1:15- 1:30	2.7	3.8	3.2	4.4	3.1
1:30- 1:45	3.0	3.1	2.9	4.2	2.8
1:45- 2:00	2.4	2.7	2.7	4.1	2.7
2:00- 2:15	1.8	2.3	2.6	3.6	2.6
2:15- 2:30	1.7	2.3	2.4	2.9	2.4
2:30- 2:45	1.7	2.3	2.3	2.6	2.0
2:45- 3:00	1.4	2.2	2.1	2.6	2.3
3:00- 3:15	1.6	2.0	1.9	2.0	2.3
3:15- 3:30	1.4	1.7	1.8	1.7	2.2
3:30- 3:45	1.6	1.7	1.8	1.8	2.3
3:45- 4:00	1.2	1.7	1.7	1.8	2.1
4:00- 4:15	1.8	1.8	1.6	1.9	2.2
4:15- 4:30	1.6	1.8	1.9	2.0	2.3
4:30- 4:45	2.4	2.0	2.2	2.1	2.2
4:45- 5:00	4.3	2.9	2.9	2.4	2.3
5:00- 5:15	4.3	3.9	5.0	3.4	2.8
5:15- 5:30	4.0	3.1	3.5	2.9	3.3

SOURCE: PUSHKAREV, E. AND ZUPAN, J., URBAN SPACE FOR PEDESTRIANS, MIT PRESS, CAMBRIDGE, MASS., 1976.

TABLE 4-9

WALKING DISTANCES IN THE CENTER CITY
FOR A SELECTED GROUP OF CITIES

DISTANCE		PERCENT WALKING THIS DISTANCE OR FURTHER	
FEET	MILES	MEAN	RANGE
0	0	100	-
250	.05	70	60-80
500	.10	50	40-60
750	.14	35	25-45
1000	.19	27	17-37
1500	.28	16	8-24
2000	.38	10	5-15
3000	.57	4	0-8
4000	.76	3	0-6
5000+	.95+	1	0-2

SOURCE: AVAILABLE PARKING SURVEYS IN ATLANTA, PITTSBURGH.
SPECIAL SURVEYS IN DALLAS, DENVER AND SEATTLE AS REPORTED IN URBAN TRANSPORTATION CONCEPTS, CENTER CITY TRANSPORTATION PROJECT, WILBUR SMITH AND ASSOCIATES, 1970.

TABLE 4-10

CENTRAL BUSINESS DISTRICT TRUCK TRIPS

URBAN AREA	STUDY YEAR	STUDY AREA POPULATION (MILLIONS)	CBD FLOOR SPACE (MIL. SQ.FT.)	CBD TRUCK TRIPS (000)	TRUCK TRIPS PER 1,000 PEOPLE	TRIPS TO, FROM, WITHIN CBD/1,000 SQ. FT.
BALTIMORE	1962	1.6	33	22	14	.667
DALLAS	1964	1.8	31	27	15	.871
LOS ANGELES	1960	7.6	76	31	4	.431
PHILADELPHIA	1960	4.0	124	43	11	.330
PITTSBURGH	1958	1.5	32	19(1)	13	.594
ST. LOUIS	1957	1.3	39	19	15	.487

(1) 1967, ALSO.

SOURCE: COMPREHENSIVE ORIGIN-DESTINATION STUDIES IN EACH URBAN AREA.

TABLE 4-11

CE) TRUCK STOP GENERATION AS RELATED TO LAND USE

TYPE OF ESTABLISHMENT	DAILY TRUCK STOPS PER 1,000 SQUARE FEET OF FLOOR AREA SOURCE OF DATA (REFERENCE NO.)(3)								
	1	2	3	4	5	6	7	RANGE	MEAN
OFFICE	.15	.20	.22	.19-.24	.20	.22	-	.15-.24	.20
BANK	-	-	-	-	.30	-	-	-	.30
RETAIL	-	-	-	.19(1)	.70	-	-	-	.45
WHOLESALE	-	-	-	-	.80	-	-	-	.80
APPAREL	-	.18-.67	-	-	.40	-	-	.18-.67	.45
DEPT. STORE	.27	.15-.37	.24	-	.20	-	.14-.37	.14-.37	.24
FURNITURE	-	.19	-	-	.60	-	-	.19-.60	.39
RESTAURANT/BAR	-	2.7-6.1	-	-	3.20	-	-	2.7-6.1	3.60
DRUG STORE	-	3.7	-	-	-	-	-	-	3.70
VARIETY STORE	-	.18	-	-	-	-	-	-	.18
SERVICES									
HOTEL	-	.20	-	-	.04	-	.03	.03-.20	.09
INSTITUTION	-	.10	-	-	-	-	-	-	.10
BUSINESS	-	-	-	-	1.80	-	-	-	1.80
PARKING	-	-	-	-	.03	-	-	-	.03
ADMINISTRATION	-	-	-	-	.40	-	-	-	.40
WAREHOUSING	-	-	-	.35	-	.53	.50(2)	-	.46
MANUFACTURING	-	-	-	.35	-	.68	-	-	.51

(1) RETAIL DISTRICT.

(2) WHOLESALE DRUG DISTRICT.

(3) REFERENCE NUMBERS ARE AS FOLLOWS:

1. WILBUR SMITH AND ASSOCIATES. CENTER CITY TRANSPORTATION STUDY, DALLAS, TEXAS, PHASE II. PREPARED FOR THE URBAN MASS TRANSPORTATION ADMINISTRATION, DECEMBER, 1970.

2. ITE PROJECT COMMITTEE 6D-62. "TRAFFIC CONSIDERATIONS IN PLANNING OF CENTRAL BUSINESS DISTRICTS". TRAFFIC ENGINEERING MAGAZINE, JUNE, 1964.

3. BARNSTEAD, R.C., "TRUCK ACTIVITIES IN THE CITY CENTER". THE URBAN MOVEMENT OF GOODS. PROCEEDINGS OF THE THIRD TECHNOLOGY ASSESSMENT REVIEW, OCTOBER, 1970. (TORONTO DATA).

4. MARCONI, WILLIAM, "COMMERCIAL VEHICLES IN A LARGE CENTRAL BUSINESS DISTRICT". TRAFFIC ENGINEERING, FEBRUARY, 1971. (SAN FRANCISCO DATA).

5. DELEUW, CATHER AND COMPANY. LONG-RANGE TRANSPORTATION PLAN FOR THE CENTRAL BUSINESS DISTRICT, DALLAS, TEXAS. JULY, 1965.

6. BATES, MALCOLM V., GOODS MOVEMENT BY TRUCK IN THE CENTRAL AREA OF SELECTED CANADIAN CITIES. PREPARED FOR THE CANADIAN TRUCKING ASSOCIATION, 1970.

7. ALAN M. VOORHEES AND ASSOCIATES, INC. "SUMMARY REPORT OF PRELIMINARY GOODS MOVEMENT DATA". PREPARED FOR THE NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS, DECEMBER, 1972.

SOURCE: ADAPTED FROM INTERIM REPORT DALLAS CBD GOODS DISTRIBUTION PROJECT TEXAS TRANSPORTATION INSTITUTE AND TEXAS A & M UNIVERSITY, JANUARY, 1974.

CHAPTER 5

RAIL SYSTEM USAGE

TABLE 5-1

RAPID RAIL TRANSIT RIDERSHIP
UNITED STATES AND CANADA (1)
1974-1975

PROPERTY	ITEM: FIRST TRACK LINE MILES (ONE-WAY)	ITEM: NUMBER OF CARS OWNED	ITEM: NUMBER OF STATIONS (APPROX.)
NEW YORK-NEW JERSEY			
NYCTA	232.0	6,685	462
PATH	13.9	298	13
CHICAGO - CTA	89.4	1,191	141
PHILADELPHIA-NEW JERSEY			
SEPTA	24.5	490	53
PATCO	14.5	75	12
BOSTON - MBTA	32.5	353	42
SAN FRANCISCO - BART	66.0	212	34
CLEVELAND (RAPID)	19.0	116	18
SUBTOTAL	491.8	9,420	775
TORONTO	26.0	418	49
MONTREAL	13.7	336	28
GRAND TOTAL	534.5	10,174	852

NOTES: EXCLUDES WMATA. OPENED 1976.

SOURCE: AMERICAN PUBLIC TRANSIT ASSOCIATION. COMPILED FROM TRANSIT OPERATING REPORTS.

TABLE 5-1
(CONTINUED)

RAPID RAIL TRANSIT RIDERSHIP
UNITED STATES AND CANADA (1)
1974-1975

PROPERTY	ITEM: ANNUAL PASSENGERS (TOTAL)	ANNUAL PASSENGERS PER/ LINE MILE (000)	ANNUAL PASSENGERS PER/ STATION (000)
NEW YORK-NEW JERSEY			
NYCTA	1,099,970,000	4,741	2,381
PATH	37,774,199	2,718	2,906
CHICAGO - CTA	128,241,794	1,434	909
PHILADELPHIA-NEW JERSEY			
SEPTA	38,894,056	3,628	1,677
PATCO	11,110,112	766	926
BOSTON - MBTA	75,000,000(2)	2,307	1,786
SAN FRANCISCO - BART	30,000,000(3)	454	882
CLEVELAND (RAPID)	11,350,000	597	630
SUBTOTAL	1,482,340,161	3,014	1,913
TORONTO	174,935,000	6,728	3,570
MONTREAL	116,413,509	8,497	4,158
GRAND TOTAL	1,773,688,670	3,318	2,082

(1) EXCLUDES WMATA. OPENED 1976.
(2) EXCLUDES GREEN LINE "LIGHT RAIL" ROUTES WHICH BRINGS THE RIDERSHIP TO ABOUT 115 MILLION.
(3) WITH TRANSBAY SERVICE - BASED ON 130,000 RIDERS/WEEKDAY.

SOURCE: AMERICAN PUBLIC TRANSIT ASSOCIATION. COMPILED FROM TRANSIT OPERATING REPORTS.

TABLE 5-2

ESTIMATED WEEKDAY
RAPID RAIL TRANSIT RIDERSHIP
1974-1975 LEVELS

PROPERTY	CONVENTIONAL RAPID TRANSIT
NEW YORK - NEW JERSEY	
NYCTA	3,717,000
PATH	155,000
SIRT	17,000
NEWARK CITY SUBWAY(4)	9,600(1)
CHICAGO - CTA	512,400
PHILADELPHIA	
RAPID TRANSIT	350,000(1)
RED ARROW DIVISION(4)	25,000(1)
PATCO	41,000(1)
BOSTON	
BLUE-ORANGE-RED LINE	302,000
GREEN LINE(4)	118,000
CLEVELAND	
RAPID TRANSIT	42,000(2)
SHAKER HEIGHTS(4)	17,000(2)
SAN FRANCISCO	
BART	120,000
MUNI-STREET CAR LINES(4)	100,000
WASHINGTON, DC	
WMATA	25,000(2) 32,000(3)
TORONTO	682,000
MONTREAL	450,000

(1) ANNUAL PASSENGERS DIVIDED BY 250-255.
(2) MAY, 1976.
(3) JUNE, 1977.
(4) LIGHT RAIL.

SOURCE: ESTIMATED, BASED ON AMERICAN PUBLIC TRANSIT ASSOCIATION STATISTICS AND RIDERSHIP INFORMATION OBTAINED FROM MAJOR PROPERTIES.

TABLE 5-3

RELATIONSHIP OF PEAK LOAD
TO DAILY PATRONAGE ON RAPID RAIL TRANSIT LINES
1974-1975

CITY AND FACILITY	ESTIMATED DAILY PATRONAGE AT MAX. LOAD POINT (TWO-WAY)	PEAK HOUR LOAD PAST MAX. LOAD POINT (ONE-WAY)	PER CENT OF DAILY PATRONAGE
NEW YORK CITY (1974)			
59TH STREET CORDON	1,305,560	170,540	13.0
QUEENS CORDON	791,170	130,610	16.5
BROOKLYN CORDON	1,109,890	179,470	16.1
PATH - LOWER MANHATTAN	82,500	29,000	24.2
PATH - MIDTOWN	51,400	10,000	19.5
CHICAGO (1973)			
NORTH-SOUTH (NORTH SIDE)	120,000	14,000	11.7
NORTH-SOUTH (SOUTH SIDE)	80,000	11,000	13.7
WEST-NORTHWEST (NW SIDE)	72,000	14,000	19.4
WEST-NORTHWEST (SW SIDE) (DOUGLAS-CONGRESS)	76,000	8,500	12.0
LAKE-RYAN (WEST SIDE)	43,000	5,800	15.8
LAKE-RYAN (SOUTH SIDE)	87,000	14,000	16.1
RAVENSWOOD(1)	45,000	6,600	14.7
EVANSTON(1)	20,000(3)	3,700	18.5
SKOKIE SWIFT(1)	7,000	1,300	18.5
PHILADELPHIA			
MARKET (SUBWAY-SURFACE)(1)			
BROAD STREET (N. OF MARKET)	96,000	8,500	8.9
MARKET-FRANKFORD (E. OF BROAD)	103,000	12,800	12.4
MARKET-FRANKFORD (W. OF BROAD)	103,000	11,700	11.3
CAMDEN-LINDENWOLD LINE - PATCO	41,000	8,000	19.5
BOSTON			
CAMBRIDGE-DORCHESTER (CAMBRIDGE)		NA	
CAMBRIDGE-DORCHESTER (DORCHESTER)		NA	
FOREST HILLS-EVERETT (FOREST HILLS)		NA	
FOREST HILLS-EVERETT (EVERETT)		NA	15.0(2)

EAST BOSTON TUNNEL(1)		NA	
SUBWAY SURFACE LINES (BOLYSTON ST.)		NA	
SUBWAY SURFACE LINES (N. STATION)		NA	
CLEVELAND			
EAST-WEST RAPID(EAST SIDE)	10,000	1,900	19.0
EAST-WEST RAPID(WEST SIDE)	34,000	5,100	15.0
SHAKER HEIGHTS RAPID(1)			
TORONTO			
YONGE STREET(1) (N. OF BLOOR)	234,000	28,000	12.0
YONGE STREET(1) (S. OF BLOOR)	265,000	36,000	13.6
BLOOR STREET (W. OF UNIVERSITY)	193,000	23,000	12.0
BLOOR STREET (E. OF YONGE STREET)	184,000	22,000	12.0
UNIVERSITY (S. OF BLOOR)	70,000	15,000	12.0
SAN FRANCISCO			
BART (CONCORD LINE)	32,000	6,200	19.4
BART (DALY CITY LINE)	36,000	6,300	17.5

(1) STUB END OPERATIONS.
(2) TOTAL FOR ALL BOSTON FACILITIES.
(3) PEAK SERVICE ONLY.

TABLE 5-4

CBD AND NON-CBD RAPID RAIL TRANSIT TRIPS

FACILITY	YEAR	DAILY ORIGINATING PASSENGERS	PERCENT ORIGINS IN CBD	PERCENT DESTINATIONS IN CBD (2)	PERCENT NON CBD (3)
NEW YORK (4)	1974	3,740,000	41	41	18
PATH	1974	155,000	40	40	20
CHICAGO	1972	530,000	36	36	28
SEPTA (RAPID)	1975	338,000	35	35	30
LINDENWOLD PATCO	1975	41,000	43	43	14
BOSTON	1973	412,000(1)	42	42	16
SAN FRANCISCO (BART)	1975	122,000	32	32	36
TORONTO	1976	685,000	36	36	28
CLEVELAND RAPID	1975	42,000	35	35	30

(1) INCLUDES LIGHT RAIL RIDERSHIP; OTHER ESTIMATES SHOW 456,000 DAILY RIDERS, 1972.
(2) DESTINATIONS ASSUMED EQUAL TO ORIGINS.
(3) 100-2 (PERCENT ORIGINS).
(4) MANHATTAN SOUTH OF 59TH STREET.

SOURCE: STATION COUNTS.

TABLE 5-5

TRAVEL MODES TO
RAPID RAIL TRANSIT STATIONS
(SYSTEM TOTALS)

CITY	ESTIMATED WEEKDAY RIDERS	PER CENT					ESTIMATED WALK BOTH WAYS(2)
		WALK	BUS	CAR KISS-RIDE	CAR PARK-RIDE	TOTAL	
BOSTON(1)-NON CBD	176,000	23	56	11	10	100	--
BOSTON-TOTAL SYSTEM	302,000	55	33	6	6	100	20-25
BART ORIGINS	NA	24	15	61		100	--
BART TOTAL SYSTEM	123,000	47	20(2)	33		100	15-20
PATCO (NEW JERSEY EAST OF CAMDEN)	19,400	13	8	79		100	
PATCO - TOTAL SYSTEM	41,000	55	8	39		100	20-25
CHICAGO CTA - TOTAL SYSTEM	512,000	63	36	0.5	0.5	100	35

(1) 1965 MODAL SPLIT DATA MODIFIED TO REFLECT CHANGES IN SYSTEM EXTENT, PARKING AND RIDERSHIP.
(2) EXPRESS BUS BART.

SOURCE: ESTIMATED FROM MODE-TO-STATION DATA FOR MAJOR PROPERTIES.

TABLE 5-6

TRAVEL MODES TO
RAPID RAIL TRANSIT TERMINAL STATIONS

CITY AND YEAR	CBD TERMINAL OR LINE-HAUL	WEEKDAY BOARDING PASSENGERS	PER CENT BY PEDESTRIAN	BUS	CAR
NEW YORK CITY					
PELHAM BAY PARK 1973-4	TERMINAL	7,800	45	55(1)	NA
WHITE PLAINS RD.-241ST 1973-4	TERMINAL	3,600	89	11(1)	NA
CHICAGO (2)					
JEFFERSON PARK (MILW)1973	TERMINAL	12,600	32	66	2(2)*
CICERO-BERWYN DOUGLAS 1973	TERMINAL	3,400	40	53	7
DESPLAINES (CONGRESS)1973	TERMINAL	3,800	17	30	25*
DEMPSTER (SKOKIE)1973	TERMINAL	3,600	71	10	19
HOWARD (NORTH-SOUTH)1973	TERMINAL	9,800	61	35	4
LINDEN (EVANSTON)1973	TERMINAL	1,900	74	-	26
KIMBALL (RAVENSWOOD)	TERMINAL	4,200	77	18	5
ASHLAND (ENGLEWOOD)	TERMINAL	6,500	29	61	10(5)
JACKSON PARK (JACKSON)	TERMINAL	5,500	20	80	-
95TH-(RYAN)	TERMINAL	22,500	28	72	-
HARLEM (LAKE)	TERMINAL	2,800	100		-
BOSTON					
NORTH					
-QUINCY CNTR. (3)1971-3	TERMINAL	14,100	32	16	52(16)*
WOLLASTON-RED LINE	LINE-HAUL				
-HARVARD SQUARE-RED LINE (3)1972-1973	TERMINAL	23,400	27	58	15(2)*
-EVERETT-ORANGE LINE (4) 1973	TERMINAL	8,200	3	85	12(4)*
-ASHMONT-RED LINE (4)1973	TERMINAL	14,800	16	70	14(10)*
-FOREST HILLS-ORANGE LINE (4) 1973	TERMINAL	14,100	9	61	30(11)*
-WONDERLAND-BLUE LINE (4)	TERMINAL	3,500	5	18	77(17)*
PATCO					
HADDENFIELD-LINDENWOLD (5)1973		5,500	5	11	84
TORONTO					
WARDEN(BLOOR) 1971		24,600	9	71	20(12)*
1975		32,700	5	80	15(8)
ISLINGTON (BLOOR) 1971		23,600	14	67	19(10)*
1975		36,600	16	70	14(6)
FINCH (YONGE) 1975		31,400	15	71	14(6)

(1) A.M. PEAK HOUR
(2) PEDESTRIAN INCLUDES NON CTA BUS ACCESS.
(3) MODE SPLIT REFLECTS SAMPLE BASED ON PASSENGERS
7:00-10:00 A.M.
(4) MODE SPLIT, 1965.
(5) MODE SPLIT, 1970.

NOTE: * KISS-N-RIDE SHOWN IN ( ) AS PERCENT OF TOTAL.

TABLE 5-7

COMMUTER RAILROAD RIDERSHIP-PRINCIPAL LINES
1973-1975

LOCATION	ROUTE MILES	WEEKDAY RIDERS	TOTAL RIDERSHIP
BOSTON			42,000
BOSTON AND MAINE	158	20,000	
PENN CENTRAL	124	22,000	
CHICAGO			239,000
BURLINGTON NORTHERN	38	44,000	
CHICAGO NORTHWESTERN	175	86,000	
CHICAGO SOUTH SHORE AND SOUTH BEND	88	8,000	
ILLINOIS CENTRAL GULF	38	49,000	
MILWAUKEE ROAD	110	24,000	
ROCK ISLAND	47	25,000	
NORFOLF AND WESTERN - PENN CENTRAL		3,000	
MONTREAL			57,000
CANADIAN NATIONAL	40	40,000	
CP RAIL	109	17,000	
NEW YORK CITY			527,000
CENTRAL OF NEW JERSEY	118	25,000	
ERIE LACKAWANA	232	70,000	
PENN CENTRAL (NJ)	73	74,000	
LONG ISLAND RAILROAD	327	214,000	202,000 (1973)
PENN CENTRAL (HAMDEN AND HUDSON)	144	81,000	75,000 (1975)
PENN CENTRAL (NEW HAVEN)	131	63,000	58,000 (1973)
PHILADELPHIA			114,000
SEPTA-PENN CENTRAL	112	68,000	73,000 (1975)
SEPTA-READING	142	46,000	44,000 (1975)
SAN FRANCISCO			18,000
SOUTHERN PACIFIC	47	18,000	
TORONTO			25,000
GO TRANSIT	90	25,000	

SOURCE: RAILWAY AGE, MAY, 1975, METROPOLITAN TRANSPORTATION AUTHORITY (NEW YORK) ANNUAL REPORT, 1975.

TABLE 5-8

RAIL TRANSIT-RELATED PARKING PATRONAGE COMPARISONS
IN MAJOR MTROPOLITAN AREAS
1970-1975

LOCATION	ESTIMATED BOARDING PASSENGERS	OFF-STREET PARKING SPACES	BOARDING PASSENGERS PER PARKING SPACE
BOSTON			
WOLLASTON	2,700	500	5.4
NORTH QUINCY	2,400	800	3.0
QUINCY CENTER	7,500	930	8.1
B & M	11,000	3,360	3.3
PENN CENTRAL	3,800	2,640	1.4
CHICAGO			
DEMPSTER	4,000	500	8.0
DESPLAINES	4,000	500	8.0
CLEVELAND			
WEST SIDE (BROOKPARK, PURITAS, TRISKETT, W 117, W 98TH)	20,000	6,400	3.1
EAST SIDE (E-55, SUPERIOR, WINDERMERE)	10,000	900	11.1
PHILADELPHIA (COMMUTER RAIL)			
BUCKS COUNTY	4,000	1,800	2.2
CHESTER COUNTY	3,900	1,100	3.5
DELAWARE COUNTY	15,500	2,200	7.0
MONTGOMERY COUNTY	19,500	4,300	4.5
PENN-CENTRAL - IN CITY	45,000	2,100	21.4
READING - IN CITY	31,600	2,700	14.6
LINDENWOLD (NEW JERSEY)	20,000	9,000	2.2
SAN FRANCISCO			
BART TOTAL	61,700(1)	18,000	3.4
BART - EAST BAY AND TRANSBAY ONLY	46,500(2)	17,000	2.7
TORONTO			
ISLINGTON	23,500	1,300	18.0
WARDEN	24,600	1,500	16.4

(1) 50 PERCENT OF TOTAL TRIPS.
(2) 50 PERCENT OF EAST BAY AND TRANSBAY TRIPS.

SOURCE: ADAPTED FROM WILBUR SMITH AND ASSOCIATES - "AN ACCESS ORIENTED PARKING STRATEGY FOR THE BOSTON METROPOLITAN AREA", 1974.

TABLE 5-9

RAPID TRANSIT
RIDERSHIP MACRO-ANALYSIS

CITY	DAILY RAPID TRANSIT RIDERS 1	DAILY COMM RAIL 2	TOTAL 3=1+2	CBD EMPLOYMENT 4	RATIO 3/4 5
			(000)		
NEW YORK	3,717,000 NYCTA				
	155,000 PATH	536,000	4,425	1,777,000(1)	2.5
	17,000 NEWARK			1,000,000	4.4
CHICAGO	512,000	269,000	781	300,000	2.6
PHILADELPHIA	350,000				
	25,000	114,000	530	225,000	2.4
	41,000				
BOSTON	420,000	42,000	462	263,000	1.8
SAN FRANCISCO	120,000	18,000	238	282,000	0.8
	100,000				
CLEVELAND	42,000	-	59	117,000	0.5
	17,000				
TORONTO	682,000	25,000	707	210,000(2)	3.4

(1) MANHATTAN, SOUTH OF 59THE STREET.
(2) CENTRAL AREA SOUTH OF BLOOR.

SOURCE: RIDERSHIP DATA FROM TRANSIT AND RAIL PROPERTIES.
CBD EMPLOYMENT DATA - TABLE 4-3.

TABLE 5-10

MAXIMUM RAPID TRANSIT LINE VOLUMES
IN RELATION TO CBD EMPLOYMENT
(1974-1975 CONDITIONS)

CITY	LINE	RIDERS	EST. CBD EMPLOYMENT	RIDES/ EMPLOYEE
NEW YORK	LEXINGTON AVE. EXPRESS (LOCAL)(1)	524,000	1,000,000	0.39-0.54
	QUEENS BLVD. EXPRESS (2)	375,000	1,777,000	0.21-0.38
CHICAGO	NS-N SIDE	120,000	300,000	0.40
PHILADELPHIA	MARKET FRANFORD WEST OR N. OF CBD	103,000	225,000	0.46
BOSTON	GREEN - W OF CBD	110,000	263,000	0.42
SAN FRANCISCO	SURFACE CARS (LRT)	100,000(3)	282,000	0.36
BART TRANSBAY		84,000(3)	282,000	0.30
CLEVELAND	WEST SIDE	34,000	117,000	0.29
	RANGE U.S.			0.29-0.54
TORONTO	YONGE	265,000	210,000	1.26

(1) EXPRESS AND LOCAL TRACKS.
(2) TWO TRACKS.
(3) TOTAL RIDERS, MAX. LOAD POINT WOULD BE LESS.

SOURCE: COMPUTED FROM RAPID TRANSIT RIDERSHIP DATA.

CHAPTER 6

BUS SYSTEM USAGE

TABLE 6-1

PEAK HOUR BUS VOLUMES ON URBAN FREEWAYS
RANKED BY PER CENT BUS PASSENGERS OF TOTAL FREEWAY PASSENGERS
DOMINANT DIRECTION OF FLOW
CURRENT CONDITIONS(1)
(1972 EXCEPT WHERE NOTED)

FACILITY AND AREA	VEHICLES PER HOUR BUS	VEHICLES PER HOUR AUTO	PASSENGERS CARRIED BUS	PASSENGERS CARRIED AUTO	PASSENGERS CARRIED TOTAL	PER CENT CARRIED BY BUS
LINCOLN TUNNEL NEW YORK	735	3,200	32,560	5,065	37,625	85.5
I-495 NEW YORK	490	3,000	21,600	4,750	26,350	82.0
SAN FRANCISCO - OAKLAND BAY BRIDGE SAN FRANCISCO-OAKLAND	327	8,115	13,000	10,400	23,400	55.5
GOWANUS NEW YORK	106	2,900	5,300	4,350	9,650	54.9(1976)
SHIRLEY HIGHWAY (I-95)	110	3,200	5,550	4,500	10,050	53.0(1972)
WASHINGTON, DC	200	3,600	10,000	5,000	15,000	67.0(1976)
BENJAMIN FRANKLIN BRIDGE PHILADELPHIA	137	4,490	5,065	5,620	10,685	47.5
LONG ISLAND EXPRESS-WAY - NEW YORK	89	2,710	3,560	4,100	7,660	46.5
MEMORIAL BRIDGE WASHINGTON, DC	100	3,690	4,020	6,650	10,670	37.6
LIONS GATE BRIDGE VANCOUVER	45	3,300	2,000	4,600	6,600	30.2
SCHUYLKILL EXPRESSWAY PHILADELPHIA	78	5,300	2,800	6,650	9,450	29.5
I-71 - CLEVELAND	35	3,200	1,850	4,500	6,350	29.0
GOLDEN GATE BRIDGE SAN FRANCISCO	80	6,650	3,750	9,250	13,000	28.8
S. CAPITOL ST. BRIDGE WASHINGTON, DC	32	3,335	1,920	5,000	6,920	27.7
SAN BERNARDINO LOS ANGELES	70	6,800	3,500	10,000	13,500	25.9(1976)
GEORGE WASHINGTON BRIDGE - NEW YORK	108	9,440	4,245	13,215	17,460	24.3
HIGHWAY BRIDGE WASHINGTON, DC	79	6,565	3,295	10,425	13,720	24.0
N. LAKE SHORE DRIVE CHICAGO	80	9,500	4,000	14,200	18,200	22.0
JOHN C LODGE FREEWAY DETROIT	40	4,950	1,800	6,920	8,720	20.6
N. CENTRAL EXPRESSWAY DALLAS	32	4,000	1,200	5,600	6,800	17.5
BAYSHORE FREEWAY SAN FRANCISCO	35	6,800	2,270	10,880	13,150	17.3
S. LAKE SHORE DRIVE CHICAGO	24	5,700	1,400	8,000	9,400	14.9
I-5 - SEATTLE	47	9,800	2,300	13,700	16,000	14.4

HOLLYWOOD FREEWAY LOS ANGELES	36	7,650	1,755	10,500	12,255	14.4
NORTH EXPRESSWAY ATLANTA	24	4,550	1,070	6,380	7,450	14.4
E. MEMORIAL SHOREWAY CLEVELAND	24	5,800	1,250	8,100	9,350	13.3
MEMORIAL DRIVE HOUSTON	11	2,250	500	3,380	3,880	12.9
STEVENSON EXPRESSWAY CHICAGO	16	4,600	840	6,900	7,740	10.9
HARBOR FREEWAY LOS ANGELES	23	7,200	1,050	10,000	11,050	9.5
I-45 N - HOUSTON	19	6,450	875	9,550	10,425	8.4
I-35 W MINNEAPOLIS-ST. PAUL	13	4,950	585	6,900	7,485	7.8
U.S. 59 - HOUSTON	13	6,900	600	10,300	10,900	5.5
I-45 S - HOUSTON	11	6,000	505	9,000	9,505	5.3
I-10 W - HOUSTON	8	5,870	370	8,800	9,170	4.0
JONES FALLS EXPRESSWAY BALTIMORE	3	2,790	125	3,900	4,025	3.1
CHRYSLER FREEWAY DETROIT	4	5,550	180	7,750	7,930	2.3

(1) INVOLVES ASSUMPTION, IN SOME CASES, AS TO CAR OR BUS OCCUPANCY.

SOURCE: ADAPTED FROM LEVINSON, H.S., ET AL, NCHRP REPORT 143, BUS USE OF HIGHWAYS-STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-2

PEAK HOUR BUS VOLUMES ON URBAN ARTERIALS
RANKED BY PERCENT BUS PASSENGERS OF TOTAL PASSENGERS
DOMINANT DIRECTION OF FLOW
CURRENT CONDITIONS (1)
1972

ARTERIAL LOCATION	PER HOUR		PASSENGERS CARRIED			PERCENT CARRIED BY BUS
	BUS	AUTO	BUS	AUTO	TOTAL	
NICOLLET MALL, MINNEAPOLIS	64	0	2,900	0	2,900	100.0
MARKET ST. (EAST OF BROAD), PHILADELPHIA	143(2)	465	8,300	695	8,995	92.5
STATE ST. @ MADISON, CHICAGO	151(2)	465	6,100	660	6,760	90.0
HILLSIDE AVENUE, NEW YORK	170(2)	630	8,500	950	9,450	90.0
PENNSYLVANIA AVE. @ 7TH, WASHINGTON, DC	120	600	6,000	900	6,900	87.0
MARKET ST. @ VAN NESS, SAN FRANCISCO	155(2)	1,200	9,900	1,550	11,450	86.5
MAIN ST. @ FOURTH ST., LOS ANGELES	115	720	5,850	1,100	6,950	84.0
MAIN STREET @ HARWOOD ST., DALLAS	100	635	4,400	900	5,300	83.0
14TH ST., WASHINGTON, DC	200	1,400	10,000	2,100	12,100	82.6
HILL ST. @ SEVENTH ST., LOS ANGELES	109	800	5,250	1,200	6,450	81.5
BROAD ST. @ HUNTER ST., ATLANTA	48	290	1,920	435	2,355	81.5
SEVENTH ST. @ MAIN ST., LOS ANGELES	91	705	4,500	1,050	5,550	81.0
FORBES AVENUE @ WOOD ST., PITTSBURGH	47	400	2,300	560	2,860	79.5
FIFTH AVENUE @ SMITHFIELD, PITTSBURGH	47	420	2,300	590	2,890	79.5
LIBERTY ST. @ SIXTH AVE., PITTSBURGH	66	650	3,250	910	4,160	78.2
"K" ST. NW @ 13TH ST., WASHINGTON, DC	130	1,300	6,500	1,950	8,450	77.0
EYE STREET @ 13TH ST., WASHINGTON, DC	104	1,100	5,200	1,600	6,800	76.5
SMITHFIELD ST. @ FIFTH AVE., PITTSBURGH	50	550	2,450	770	3,220	76.0
THIRTEENTH ST. @ "F" ST., WASHINGTON, DC	101	1,050	5,000	1,600	6,600	75.8
BROADWAY @ SIXTH ST., LOS ANGELES	78	850	4,000	1,390	5,390	74.5
ADAMS STREET BRIDGE, CHICAGO	107	785	3,425	1,220	4,645	73.7
GRANVILLE ST. @ GEORGIA, VANCOUVER	70	900	3,150	1,200	4,350	72.5

WISCONSIN AVENUE, MILWAUKEE	78	935	3,100	1,200	4,300	72.0
CHESTNUT @ 12TH ST., PHILADELPHIA	67	890	3,350	1,350	4,700	71.5
STATE STREET @ ROOSE-VELT, CHICAGO	72	670	2,305	935	3,240	71.4
WASHINGTON ST. @ WACKER, CHICAGO	108	1,100	3,800	1,540	5,340	71.4
WASHINGTON STREET BRIDGE, CHICAGO	152	1,250	4,680	1,920	6,600	70.9
WOOD STREET @ FORSYTH AVE., PITTSBURGH	55	800	2,700	1,120	3,820	70.8
SEVENTH ST. @ PENNSYLVANIA AVE., WASHINGTON, DC	80	1,150	4,000	1,720	5,720	70.0
MAIN STREET @ PRATT, HARTFORD	75	625	1,875	815	2,690	70.0
JACKSON BLVD. BRIDGE, CHICAGO	88	845	2,815	1,325	4,140	68.0
SIXTH AVE. @ SMITHFIELD, PITTSBURGH	33	560	1,620	780	2,400	67.6
EGLINGTON AVE. @ BATHURST, TORONTO	80	1,200	3,300	1,700	5,000	66.0
ELM STREET @ HARWOOD, DALLAS	80	1,345	3,500	1,880	5,380	65.2
SACRAMENTO ST., SAN FRANCISCO	25	410	1,000	535	1,535	65.0
CONSTITUTION AVE. @ 15TH, WASHINGTON, DC	120	2,200	6,000	3,300	9,300	64.5
SPRING ST. @ 7TH ST.,LOS ANGELES	111	1,500	4,450	2,500	6,950	64.0
16TH ST. @ FLORIDA AVE.,WASHINGTON, DC	80	1,500	4,000	2,250	6,250	64.0
14TH ST. @ CONSTITUTION AVE.,WASHINGTON, DC	80	1,550	4,000	2,350	6,350	63.0
CONNECTICUT AVE. & CATHE-DRAL AVE.,WASH., DC	90	1,800	4,500	2,700	7,200	62.5
WALNUT @15TH ST., PHILADELPHIA	48	960	2,400	1,450	3,850	62.5
COMMERCE ST. @ ST. PAUL, DALLAS	72	1,415	3,300	2,120	5,420	61.0
SHERIDAN @ HOLLYWOOD, CHICAGO	32	500	1,100	700	1,800	61.0
MICHIGAN AVE. @ ROOSE-VELT RD., CHICAGO	77	770	1,815	1,210	3,025	60.0
ASYLUM @ MAIN ST., HARTFORD	35	450	875	585	1,460	60.0
MICHIGAN AVE. BRIDGE, (UPPER LEVEL),CHICAGO	116	1,590	3,580	2,390	5,970	60.0

(CONTINUED)

TABLE 6-2 (CONTINUED)

ARTERIAL LOCATION	PER HOUR BUS	PER HOUR AUTO	PASSENGERS CARRIED BUS	PASSENGERS CARRIED AUTO	PASSENGERS CARRIED TOTAL	PERCENT CARRIED BY BUS
SUTTER ST., SAN FRANCISCO	63	1,300	2,500	1,700	4,200	59.5
MADISON AVE. @ 42ND ST., NEW YORK	96	2,400	4,800	3,600	8,400	57.1
SECOND AVE. @ 42ND AVE., NEW YORK	110	2,800	5,500	4,200	9,700	56.8
FIRST AVE. @ 49TH ST., NEW YORK	110	2,800	5,500	4,200	9,700	56.8
SIXTH ST. @ FIGUEROA, LOS ANGELES	29	965	1,875	1,430	3,305	56.7
GEORGIA AVE. @ GRANVILLE, VANCOUVER	45	1,200	2,000	1,600	3,600	55.5
CLAY STREET, SAN FRANCISCO	26	650	1,050	850	1,900	55.3
NINTH ST. @ MARKET ST., PHILADELPHIA	22	600	1,100	900	2,000	55.0
SECOND AVE. NORTH, BIRMINGHAM, ALABAMA	44	1,400	2,300	1,950	4,250	54.0
GRAND AVE. @ TEMPLE ST., LOS ANGELES	24	855	1,400	1,215	2,615	53.5
GEARY STREET, SAN FRANCISCO	43	1,250	1,720	1,630	3,350	51.4
HOWARD ST. @ FAYETTE ST., BALTIMORE	30	470	790	755	1,545	51.0
MARIETTA @ SPRING ST., ATLANTA	35	1,050	1,400	1,580	2,980	47.0
PEACHTREE @ ELLIS, ATLANTA	55	1,700	2,200	2,550	4,750	46.5
TRYON ST., CHARLOTTE, NORTH CAROLINA	40	1,150	1,200	1,700	2,900	41.4
EIGHTH STREET @ LOS ANGELES ST., LOS ANGELES	30	1,155	1,290	1,835	3,130	41.3
O'FARRELL STREET, SAN FRANCISCO	27	1,200	1,080	1,550	2,630	41.2
TRADE STREET, CHARLOTTE, NORTH CAROLINA	30	1,000	1,000	1,500	2,500	40.0
PRATT STREET @ PACA ST., BALTIMORE	64	2,390	2,215	3,825	6,040	36.7
CHARLES ST. @ MADISON ST., BALTIMORE	33	1,915	1,480	3,060	4,540	32.6
LOMBARD ST. @ GREENE ST., BALTIMORE	42	1,750	1,335	2,800	4,135	32.0
ELEVENTH STREET BRIDGE, WASHINGTON, DC	54	4,120	2,870	7,735	10,605	27.1
CATHEDRAL STREET @ EAGER, BALTIMORE	36	1,545	880	2,470	3,350	26.3
ST. PAUL ST. @ PRESTON, BALTIMORE	45	2,815	1,375	4,505	5,880	23.4
CALVERT ST. @ LEXINGTON, BALTIMORE	39	2,645	1,185	4,230	5,415	21.9

(1) DATA COMPILED BY WILBUR SMITH AND ASSOCIATES INVOLVES ASSUMPTIONS IN SOME CASES AS TO CAR OR BUS OCCUPANCY.
(2) BUSES OPERATE IN MORE THAN ONE LANE.

SOURCE: ADAPTED FROM LEVINSON, H.S., ET AL, NCHRP REPORT 143 - BUS USE OF HIGHWAYS, STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-3

PRINCIPAL CENTRAL AREA BUS TERMINALS
(UNITED STATES)

NAME OF TERMINAL	DEVELOPMENT(1) COSTS (000)	TYPE OF BUS SERVICE	NUMBER OF BUS LEVELS	NUMBER OF BUS LOADING DOCKS	CONTIGUOUS TRANSP. FACILITIES	ACCESS CONNECTIONS
PORT AUTHORITY BUS TERMINAL, NEW YORK, NY 1950	$58,000	COMMUTER AND INTERCITY	3	184	SUBWAY, LOCAL BUS, AUTO PARKING	DIRECT RAMP CONNECTIONS WITH LINCOLN TUNNEL
GEORGE WASHINGTON BRIDGE BUS TERMINAL, NEW YORK, NY 1963	15,300	COMMUTER AND INTERCITY	2	43	SUBWAY, LOCAL BUS	DIRECT RAMP CONNECTIONS WITH GEORGE WASHINGTON BRIDGE
GREYHOUND BUS TERMINAL, CLARK AND RANDOLPH STS. 1952	8,000	MAINLY INTERCITY	1	30	SUBWAY, LOCAL BUS, CURB PARKING	TUNNEL AND RAMP CONNECTIONS WITH GARVEY ST. AND WACKER DR.
TRANSBAY BUS TERMINAL, SAN FRANCISCO, CA 1960	11,000	INTERCITY AND COMMUTER	1	37	LOCAL BUS, AUTO PARKING	DIRECT RAMP CONNECTIONS WITH SAN FRANCISCO-OAKLAND BAY BRIDGE
DIXIE TERMINAL EAST, CINCINNATI, OH 1921,1936 (3)	NA	COMMUTER	1	6(2)	LOCAL BUS, AUTO PARKING	DIRECT RAMP ACCESS TO SUSPENSION BRIDGE OVER OHIO RIVER
MARKET STREET EAST, PHILADELPHIA, PA PLANNED	NA	INTERCITY AND COMMUTER	2	70	SUBWAY, RAILROAD STREETCAR, LOCAL BUS, AUTO PARKING	DIRECT RAMP CONNECTIONS WITH VINE ST. EXPWY.

(1) DATA ON MAINTENANCE COSTS AND REVENUES ARE UNAVAILABLE.
(2) ALSO FOUR UNLOADING AND SIX LOADING DOCKS.
(3) RAILCARS - 1921, BUSES - 1936.

NOTE: NA - NOT AVAILABLE.

SOURCE: ADAPTED FROM LEVINSON, H.S., ET AL, NCHRP REPORT 143, BUS USE OF HIGHWAYS-STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-3
(CONTINUED)

PRINCIPAL CENTRAL AREA BUS TERMINALS
(UNITED STATES)

NAME OF TERMINAL	(1) NUMBER OF PASSENGERS DAILY	PK.HR.	(1) NUMBER OF BUSES DAILY	PEAK HOUR	AVERAGE BUS OCCUPANCY DAILY	PEAK HOUR	AVG. NUMBER OF BUSES PER DOCK DAILY	PEAK HOUR	AVERAGE BUS LAYOVER TIME DAILY (HRS.)	PEAK HR.
PORT AUTHORITY BUS TERMINAL, NEW YORK, NY 1950	105,500	32,600	3,350	730	27.4	44.1	18.2	4.0	1.32	0.25
GEORGE WASHINGTON BRIDGE BUS TERMINAL, NEW YORK, NY 1963	20,000	4,200	850	108	23.5	39.0	19.6	2.5	1.22	0.4
GREYHOUND BUS TERMINAL, CLARK AND RANDOLPH STS 1952			---	---	---	---	---	---		---
TRANSBAY BUS TERMINAL, SAN FRANCISCO, CA 1960	44,000	13,000	2,200	350	20.0	37.2	59.5	9.5	0.40	0.16
DIXIE TERMINAL EAST, CINCINNATI, OH 1921,1936 (4)	5,000	1,800	195	38	25.4	37.5	32.5	8.0	0.16	0.08
MARKET STREET EAST, PHILADELPHIA, PA PLANNED	NA	5,900	NA	170	NA	35	NA	2.4	NA	0.42

(1) ONE DIRECTION ONLY BUS VOLUMES.

NOTE: NA - NOT AVAILABLE.

SOURCE: ADAPTED FROM LEVINSON, H.S., ET AL, NCHRP REPORT 143, BUS USE OF HIGHWAYS-STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-3
(CONTINUED)

PRINCIPAL CENTRAL AREA BUS TERMINALS
(UNITED STATES)

NAME OF TERMINAL	ANCILLARY LAND USES	REMARKS
PORT AUTHORITY BUS TERMINAL, NEW YORK, NY 1950	RETAIL CONVENIENCE GOODS, RESTAURANTS	1,080 CARS; SAVES BUSES 30 MINS. OVER PREVIOUS OPERATIONS
GEORGE WASHINGTON BRIDGE BUS TERMINAL, NEW YORK, NY 1963	RETAIL CONVENIENCE GOODS, RESTAURANTS	LOCATED OVER CROSS BRONX EXPRESSWAY
GREYHOUND BUS TERMINAL, CLARK AND RANDOLPH STS. 1952	RETAIL CONVENIENCE GOODS AND OFFICES OVER	DESIGNED TO ALLOW OFFICE BUILDING OVER STATION
TRANSBAY BUS TERMINAL, SAN FRANCISCO, CA 1960	RETAIL CONVENIENCE GOODS	PRIOR TO 1960 KEY SYSTEM TAXIS USED TERMINAL
DIXIE TERMINAL EAST, CINCINNATI, OH 1921,1936 (1)	RETAIL, OFFICES, RESTAURANTS	FORMER INTERURBAN RAIL TERMINAL SHARED BY RAIL AND BUS 1936-1950. BUS ONLY SINCE 1950.
MARKET STREET EAST, PHILADELPHIA, PA PLANNED	RETAIL, OFFICES HOTEL	3,000 OR MORE PARKING SPACES PLANNED

(1) RAILCARS - 1921, BUSES - 1936.

NOTE: NA - NOT AVAILABLE.

SOURCE: ADAPTED FROM LEVINSON, H.S., ET AL, NCHRP REPORT 143, BUS USE OF HIGHWAYS-STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-4

PRINCIPAL OUTLYING BUS-RAIL TERMINALS
UNITED STATES AND CANADA

NAME OF TERMINAL	NUMBER OF BUS LOADING BERTHS	CONTIGUOUS TRANSPORTATION FACILITIES	NUMBER OF PASSENGERS (1)		NUMBER OF BUSES (1)		AVERAGE BUS LAY-OVER TIME	
			DAILY	PEAK HR.	DAILY	PEAK HOUR	DAILY (HRS)	PEAK HOUR (HRS)
BOSTON, MA KENMORE SQU. BUS TERMINAL	4	MBTA, SUBWAY	NA	1,500	NA	35	--	.15
CHICAGO, IL 69TH ST. TERMINAL, DAN RYAN EXPRESSWAY	4	DAN RYAN RAPID TRANSIT	8,000	2,000	NA	40	--	.10
CHICAGO, IL 95TH ST. TERMINAL, DAN RYAN EXPRESSWAY	22	DAN RYAN RAPID TRANSIT	20,000	5,000	NA	110	--	.20
CHICAGO, IL JEFFERSON PARK TERMINAL	14	KENNEDY RAPID TRANSIT, CNW RAILROAD	12,000	3,000	NA	140	--	.20
PHILADELPHIA, PA, 59TH ST. @ W. CHESTER PIKE TERMINAL	10(3)	MARKET ST. RAPID TRANSIT SUBURBAN RAIL	15,000	3,700	800	90	.30	.11
TORONTO, CANADA EGLINGTON AVE. @ YONGE ST. TERMINAL	13	YONGE RAPID TRANSIT	55,000	15,000	1,500 (2)	250	.21 (2)	.05
WASHINGTON, DC S.W. BUS TERMINAL	10	LOCAL TRANSIT	700	400	200	80	2.4	.12

(1) ONE-WAY ONLY/BUSES AND PASSENGERS ENTERING STATION.
(2) ESTIMATED.
(3) SOME BERTHS SHARED WITH STREET CARS.

SOURCE: LEVINSON, H.S., ET AL, NCHRP REPORT 143 - BUS USE OF HIGHWAYS: STATE OF THE ART, TRANSPORTATION RESEARCH BOARD, 1975.

TABLE 6-5

TAXICAB LICENSES PER 1,000 POPULATION ORDERED ACCORDING TO POPULATION OF JURISDICTION SERVED (1970 POPULATION 500,000 OR MORE)

CITY	POPULATION SERVED (THOUSANDS)	LICENSES	LICENSES PER 1,000 POPULATION
NEW YORK	7,867	11,754	1.49
CHICAGO	3,366	4,600	1.37
LOS ANGELES	2,816	1,024	.37
PHILADELPHIA	1,948	1,750	.90
DETROIT	1,511	1,358	.90
HOUSTON	1,232	473	.38
BALTIMORE	905	1,151	1.27
DALLAS	844	507	.60
VAN NUYS (1)	790	50	.06
WASHINGTON	764	8,500	11.13
CLEVELAND	750	560	.75
INDIANAPOLIS	744	482	.65
SAN FRANCISCO	715	756	1.06
MILWAUKEE	713	423	.59
SAN DIEGO	696	304	.44
SAN ANTONIO	654	518	.79
BOSTON	641	1,575	2.46
MEMPHIS	623	400	.64
ST. LOUIS	622	1,267	2.04
NEW ORLEANS	593	1,500	2.53
PHOENIX	581	95	.16
COLUMBUS	539	351	.65
SEATTLE	530	316	.59
JACKSONVILLE	528	270	.51
SAN GABRIEL	525	52	.10
PITTSBURGH	520	550	1.06
DENVER	514	317	.62
KANSAS CITY	507	542	1.07

(1) INCLUDES PARTS OF SURROUNDING COMMUNITIES.

SOURCE: INTERNATIONAL TAXICAB ASSOCIATION AS REPORTED IN WEBSTER, A.C., WEINER, E., WELLS, J.D., THE ROLE OF TAXICABS IN URBAN TRANSPORTATION, U.S. DEPARTMENT OF TRANSPORTATION, DECEMBER 1974.

CHAPTER 7

AUTO SYSTEM USAGE

TABLE 7-1

DAILY URBAN FREEWAY AND EXPRESSWAY VOLUMES
MAXIMUM LOAD POINTS

CITY	1970 URBANIZED AREA POPULATION	FACILITY	LANES	YEAR	AVERAGE DAILY TRAFFIC
ATLANTA, GA	1,172,778	I-75		1974	142,000
BOSTON, MA	2,652,575	I-93 (CENTRAL ARTERY)	6	1974	135,000
BUFFALO, NY	1,086,594	I-90		1970	60,000
CHICAGO, IL	6,714,578	I-90-94 (DAN RYAN)	14	1972	262,000
CLEVELAND, OH	1,959,880	I-90	8	1972	94,000
DALLAS, TX	1,338,684	I-35		1974	139,000
DENVER, CO	1,047,311	I-75	6	1974	145,000
DETROIT, MI	3,970,584	M-10 (LODGE)	6	1972	173,000
HOUSTON, TX	1,617,863	I-610	8-10	1976	174,000
JACKSONVILLE, FL	529,585	I-10		1969	99,000
KANSAS CITY, MO	1,101,787	I-70		1976	96,800
LOS ANGELES, CA	8,351,266	I-10(SANTA MONICA)	10-14	1975	243,000
MIAMI, FL	1,219,661	I-95	8	1975	169,000
MILWAUKEE, WI	1,252,457	I-94 (N-S FREEWAY)		1975	97,000
NEW ORLEANS, LA	961,728	I-10		1975	100,000
NEW YORK, NY	16,206,841	GEORGE WASHINGTON BRIDGE	14	1973	220,000
PHILADELPHIA, PA	4,021,066	SCHUYKILL EXPSWY.	6	1963	110,000
PITTSBURGH, PA	1,846,042	I-279		1973	77,000
RICHMOND, VA	416,563	RICHMOND-PETERSBURG TPK.		1973	66,000
SACRAMENTO, CA	633,732	CAL. 99 FREEWAY		1975	110,000
SAN DIEGO, CA	1,198,323	I-5		1975	161,000
SAN FRANCISCO, CA	2,987,850	S.F.-OAKLAND BAY BRIDGE	10	1973	184,000
SAN JOSE, CA	1,025,273	U.S. 101 (NIMITZ	6-8	1973	101,000
SEATTLE, WA	1,238,107	I-5 FREEWAY)	12	1975	169,000
SPRINGFIELD, MA	514,308	I-291	6	1974	63,300
WASHINGTON, DC	2,481,489	I-95	8+	1975	143,000

SOURCE: TRAFFIC VOLUME COUNTS FOR EACH URBAN AREA.

TABLE 7-2

PEAK HOUR URBAN FREEWAY AND EXPRESSWAY VOLUMES

CITY AND 1970 URBANIZED AREA POPULATION	FACILITY	NO. OF LANES	YEAR	AVERAGE DAILY TRAFFIC	PEAK DIRECTIONAL VOLUMES	
					VEHICLES	% OF ADT
ATLANTA, GA 1,172,778	I-20 E. OF CBD @ MORELAND AVE.		1975	105,100	5,980	5.7
	I-75 S. OF CBD @ UNIVESITY AVE.		1975	110,800	6,200	5.6
	I-20 W. OF CBD @ MOZLEY DR.		1975	78,600	4,450	5.7
	I-75 N. OF CBD (N. OF I-85)		1975	72,800	4,500	6.2
	I-85 N. OF I-75 @ MONROE DR.		1975	90,100	5,500	6.1
BOSTON, MA 2,652,575	I-93 @ STONEHAM TOWN LINE	6-8	1975	80,300	6,270	7.8
	S.E. EXPWY. @ SOUTHAMPTON	6-8	1975	129,000	7,060	5.4
	RT. 128 @ BURLINGTON TOWN LINE	8	1975	86,400	5,660	6.6
CHICAGO, IL 6,714,578	LAKE SHORE DR. @ 49TH ST.	6-8	1975	61,100	4,120	6.8
	LAKE SHORE DR. @ ALDINE	8	1975	117,000	9,380	8.0
DENVER, CO 1,047,311	I-25 BETW. 38TH AVE. AND I-70	6	1974	145,000	7,500	5.2
	I-225 BETW. I-25 & WASHINGTON ST.	6	1974	105,000	5,400	5.1
	US 6 BETW. LOWELL BLVD. & FEDERAL BLVD.	4	1974	83,000	8,000	9.6
DETROIT, MI 3,970,584	FORD FWY. (I-94)	6	1975	161,500	5,570	3.4

	@ CHRYSLER FWY.					
	JEFFERS FWY.(I-96) @ WARREN		1974	72,100	4,850	6.7
	SOUTHFIELD FWY. (M39)@ PLYMOUTH	6	1973	142,100	6,210	4.4
	LODGE (M10) @ PALLISTER	6	1972	173,000	5,310	4.0
	FISHER FWY. @ LODGE	6-8	1972	118,100	5,310	4.5
HOUSTON, TX 1,677,863	I-45 - GULF @ VELASCO	8	1976	156,500	5,610	4.2
	I-45 - GULF @ WOODBRIDGE	6	1976	106,600	4,910	4.6
	US 59 - EASTEX @ BUFFALO BAYOU	8	1976	112,900	7,100	6.3
	US 59 - S.W. @ MONTROSE	10	1976	145,900	8,470	5.8
	US 59 S.W. @ RICE AVE.	8	1976	162,700	6,730	4.1
	I-45 - NORTH S. OF NORTH LOOP	8	1976	121,900	7,420	6.0
	I-10 - EAST W. OF WACO ST.	8	1976	117,600	7,090	6.0
	I-10 - EAST E. OF MCCARTY	8	1976	89,800	7,100	7.9
	I-610 WEST @ BUFFALO BAYOU	8-10	1976	174,400	9,520	4.5-5.4
	I-10 NORTH E. @ N. MAIN	8	1976	125,300	6,640	5.3
	I-610 - KATY E. OF TAYLOR ST.	10	1976	109,500	7,600	6.9
	I-610 - SOUTH W. OF MAIN	8	1976	100,300	6,700	6.7
	I-610 - SOUTH W. OF TELEPHONE	8	1976	88,800	5,230	5.9
	I-10 - EAST @ ELYSIAN	8	1976	75,400	4,540	6.0

	I-610 - EAST @ SHIP CHANNEL	10	1976	76,300	5,880	7.7
MILWAUKEE, WI 1,252,457	N-S FWY @ WISCONSIN		1975	90,310	5,260	5.8
	N-S FWY @ GREENFIELD		1975	96,770	5,780	6.0
	E-W FWY @ 26TH ST.		1975	93,280	5,000	5.4
	ZOO FWY @ WISCONSIN		1975	40,000	3,790	4.6
	AIRPORT FWY @ 68TH		1975	62,300	3,520	5.7
NEW YORK CITY, NY 16,206,841	LONG ISLAND EXPWY	6	1973	165,000	5,300	3.2
	FDR DRIVE	6	1974	117,000	4,400	3.8
	HOLLAND TUNNEL	4	1974	61,400	2,400	3.9
	LINCOLN TUNNEL	6	1974	97,300	4,900	5.0
	BROOKLYN-BATTERY TUNNEL	4	1974	46,700	3,400	7.3
SAN FRANCISCO, CA 2,987,850	OAKLAND-BAY BRIDGE (I-80)	10	1973	184,000	8,120	4.4
	JAMES LICK FWY (U.S. 101)	8	1975	113,400	8,080	4.0
	SOUTHERN FWY (I-280)	8	1969-73	114,000	6,150	5.4
	GOLDEN GATE BRIDGE (U.S. 101)	6	1969-73	92,000	5,720	6.2
WASHINGTON, DC 756,510	SHIRLEY HWY (N. OF 4 MILE RIVER)	8	1975	136,000	8,010	5.2
	CENTER LEG FWY		1975	68,000	3,410	5.0
	I-95 BRIDGE (OVER POTOMAC)	8	1975	142,700	6,260	4.4
	BALT-WASH PKWY (DISTRICT LINE)	6	1975	101,300	4,930	4.9
	WOODROW WILSON	6	1975	97,800	4,620	4.7

BRIDGE					
S.W. FWY (8TH ST.)	8	1975	118,300	5,400	4.6
THEODORE ROOSEVELT BRIDGE	6	1975	55,800	4,280	8.6
ANACOSTIA FWY (HOWARD ROAD)	6	1975	95,100	4,770	5.0

TABLE 7-3

TYPICAL TRUCK VOLUMES ON URBAN FREEWAYS

CITY AND YEAR	LOCATION	ADT	COMMERCIAL VEHICLES	% ADT	TRACTOR TRAILERS (HEAVY TRUCKS)	% ADT
CHICAGO, IL 1972	I-90-94 S OF LOOP	215,000	31,900	15	18,200	8
	I-55 SW OF LOOP	100,600	14,100	14	9,200	9
	I-90 SW OF LOOP	173,800	13,200	8	4,800	3
	I-94(N OF KENNEDY)	74,700	9,000	12	4,500	6
	I-94(S OF 95TH ST.)	76,700	15,300	20	9,000	12
	I-57(S OF 95TH ST.)	54,400	5,800	71	2,600	5
	I-294(E OF TOLLWAY)	126,400	13,100	10	4,300	3
ST. LOUIS, IL 1972	I-55-70(MISSISSIPPI RIVER)	75,300	14,800	20	5,300	7
	I-55-70(E OF IL.203)	36,800	6,200	17	2,400	7
ST.LOUIS, MO 1967	I-55 LINDBERGH BLVD.	27,545	1,720	6	910	3
	I-44 LINDBERGH BLVD.	24,930	2,640	11	1,870	8
	I-70 LINDBERGH BLVD.	40,530	2,690	7	1,670	4
	US 40 LINDBERGH BLVD.	33,735	880	3	390	1
1965	US 40 CITY LIMITS	68,130	3,210	5	--	--
WISCONSIN 1968	I-94 CENTRAL AREA	41,500	6,500	16	--	--
NEW YORK CITY 1971	GEORGE WASHINGTON BRIDGE	196,600	21,600	11	--	--
	LINCOLN TUNNEL	80,400	14,000	17	--	--
	HOLLAND TUNNEL	56,400	14,800	26	--	--
NEW JERSEY 1974	TPK INTERCHANGE 12 - 13	178,000	28,000	16	--	--

SOURCE: WILBUR SMITH AND ASSOCIATES, URBAN TRUCK ROUTE SYSTEMS AND TRAVEL RESTRICTIONS, OCTOBER, 1975.

TABLE 7-4

DISTRIBUTION OF ARTERIAL TRAVEL
BETWEEN FREEWAYS AND ARTERIAL STREETS

TABLE VALUES ARE PERCENT OF TOTAL ARTERIAL TRAVEL ON FREEWAYS.

	% OF TOTAL ARTERIAL CAPACITY PROVIDED BY FREEWAYS					
POPULATION (000)	10%	20%	30%	40%	50%	60%
50 - 250	2%	7%	13%	19%	26%	35%
250 - 500	3%	9%	16%	24%	32%	42%
500 - 1,000	5%	12%	19%	28%	37%	48%
1,000+	7%	14%	23%	31%	41%	49%

SOURCE: TABULATED FROM FEDERAL HIGHWAY ADMINISTRATION NATIONAL HIGHWAY FUNCTIONAL CLASSIFICATION STUDY DATA.

TABLE 7-5

ANTICIPATED MAXIMUM LOAD POINTS
ON FREEWAY SYSTEM

URBANIZED AREA POPULATION	RANGE ADT (ROUNDED)
250,000	35,000 - 60,000
500,000	40,000 - 100,000
1,000,000	60,000 - 150,000
2,000,000	80,000 - 200,000
3,000,000	100,000 - 210,000
4,000,000	110,000 - 220,000
5,000,000	120,000 - 230,000
10,000,000	180,000 - 250,000

SOURCE: ESTIMATED, BASED ON TABLE 7-1.

*U.S. GOVERNMENT PRINTING OFFICE: 1982 522-046/8545 1-3

U.S. DEPARTMENT OF TRANSPORTATION
URBAN MASS TRANSPORTATION
ADMINISTRATION
Washington, D.C. 20590

Official Business

PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
URBAN MASS TRANSPORTATION
ADMINISTRATION

DOT 511

U.S.MAIL

DOT LIBRARY
00399632